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METALS *and* ALLOYS

The Magazine of Metallurgical Engineering

PRODUCTION • FABRICATION • TREATMENT • APPLICATION

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Highlights

WRITTEN BY THE ABSTRACT SECTION EDITORS AND THE EDITORIAL STAFF

Do you want to know what metallurgical engineers are saying, the world over? Look in the Current Metallurgical Abstracts. Here are some of the points covered by authors whose articles are abstracted in this issue.

Hydrogen in Liquid and Solid Steel

According to Bardenheuer and Keller (page MA 542 R 2) H_2 in a steel melt is very choosy; it will only bite onto oxygen, not onto carbon, but in solid steel H_2, freed from solution in the lattice, can react with C, etc.—H.W.G.

Valuable Suggestions for Foundrymen

Deschamps (page MA 542 R 5) suggests putting what is essentially a linseed oil core sand mix with a dryer on the pattern as a facing sand, letting this facing set in air without baking and pouring steel into the unbaked mold. Sounds interesting if the facing will harden quickly enough. He also advocates keeping the risers on big steel castings fluid for hot-topping purposes, by arcs struck to the riser, along the line of the hot-topping of Monel ingots.—H.W.G.

Novel Use for a Thermocouple

Schallbroch and Schaumann (page MA 545 R 7) made some interesting studies in machining by using a thermocouple in a cutting tool to give the temperature of the cutting edge under various conditions.—B.W.G.

Another Special Powder

A British foundry announces a special powder which can be used to treat all steels and cast irons of low graphite content to produce corrosion and heat resisting products. The product means are C. Y. alloy, E. V. alloy and E. V. H. 1 alloy. It appears from the abstract (page MA 546 R 3) that there is still more metallurgical research needed to find out how the process works.—O.E.H.

Annealing Tips of Cartridge Shells

An interesting means for annealing the tips of cartridge shells by induction heating is described by Sevin (page MA 546 R 8). Some 90 shells a minute are treated in the apparatus designed for this purpose.—B.W.G.

200-Inch Telescope Parts Arc Welded

The decision to employ arc welding so extensively in the construction of the tube and mounting of the 200-inch telescope for Mount Palomar is another outstanding example of the confidence in the welding art that has developed recently. The past few years have witnessed a widespread adoption of welding in important engineering construction, often replacing older methods of manufacturing. Progress in the welding art has been quite amazing.

And yet the adoption of welded construction for the various number parts of the telescope does not mean that there is anything of an experimental nature involved. On the contrary, many other structures of comparable size and complexity, and of equal value and importance, have already been successfully produced by welding.

While the size and shape of the several welded member parts naturally reflect the general design, these have also been influenced by practical considerations, such as availability of material, machining facilities, transportation and the necessity for minimizing internal stresses and resulting distortions (MA 554 L 3).—E.V.D.

Rapid Malleablizing

Manaserian and co-workers in Russia (page MA 549 L 7) claim that the malleablizing of white Fe castings can be done more rapidly by first quenching the work in oil from 850-900 deg. C. The subsequent cycle covers heating to 950 deg. C. for 3 to 6 hrs., cooling to 760 deg. C. and holding for 6 to 8 hrs., then cooling with the furnace. Whether the time and trouble for the extra operations would result in much of a saving over the present short anneal of 45 to 50 hrs., such as described by Bremer (page MA 549 R 7), is open to question.—B.W.G.

New Data on Inhibitors

The inhibiting action of various organic materials in pickling is due to adsorption of the inhibitor on the bare Fe surface, thereby restricting the action of the acid to the scale, according to Machu (page MA 560 L 5). The quality of the inhibitor is measured by the electrical resistance of the adsorbed layer on the Fe.—B.W.G.

Plating of Aluminum

The successful electroplating of aluminum is dependent on the securing of a firm mechanical bond between coating and basis metal by a suitable preliminary treatment. The announcement (page MA 560 R 4) of the production of firmly adherent electroplating on aluminum without the preliminary etching treatment is, indeed, good news.—H.S.R.

Plating as a Competitor of Hot Galvanizing

Ninety tons of wire is a lot of metal to be zinc coated in a day and when one hears that much wire is being coated by the electroplating method, he is doubly impressed (page MA 560 R 7). The constantly increasing successful use of the electroplating method for coating wire (page MA 560 R 9) serves to bolster up the hopes of those who would like to be able to secure sheet materials zinc-coated in a similar way.—H.S.R.

Phases in the Cr-Al System

Bradley & Lu (page MA 566 L 3) find 11 phases in the Cr-Al system. Too bad they couldn't make it an even dozen.—H.W.G.

Austempering Again

Bain and Davenport's classic interrupted-quenching studies of austenitic transformation have been corroborated by Portevin and Chevenard (page MA 566 L 5) with alloy steels.—F.P.P.

Steels for Deep Drilling

It takes good alloy steel to drill deep oil wells. Wilson (page MA 572 R 3) and Zima (page MA 572 R 5) review the characteristics of some of the Mo, Ni, Cr alloy steels used.—B.W.G.

Singing Propellors

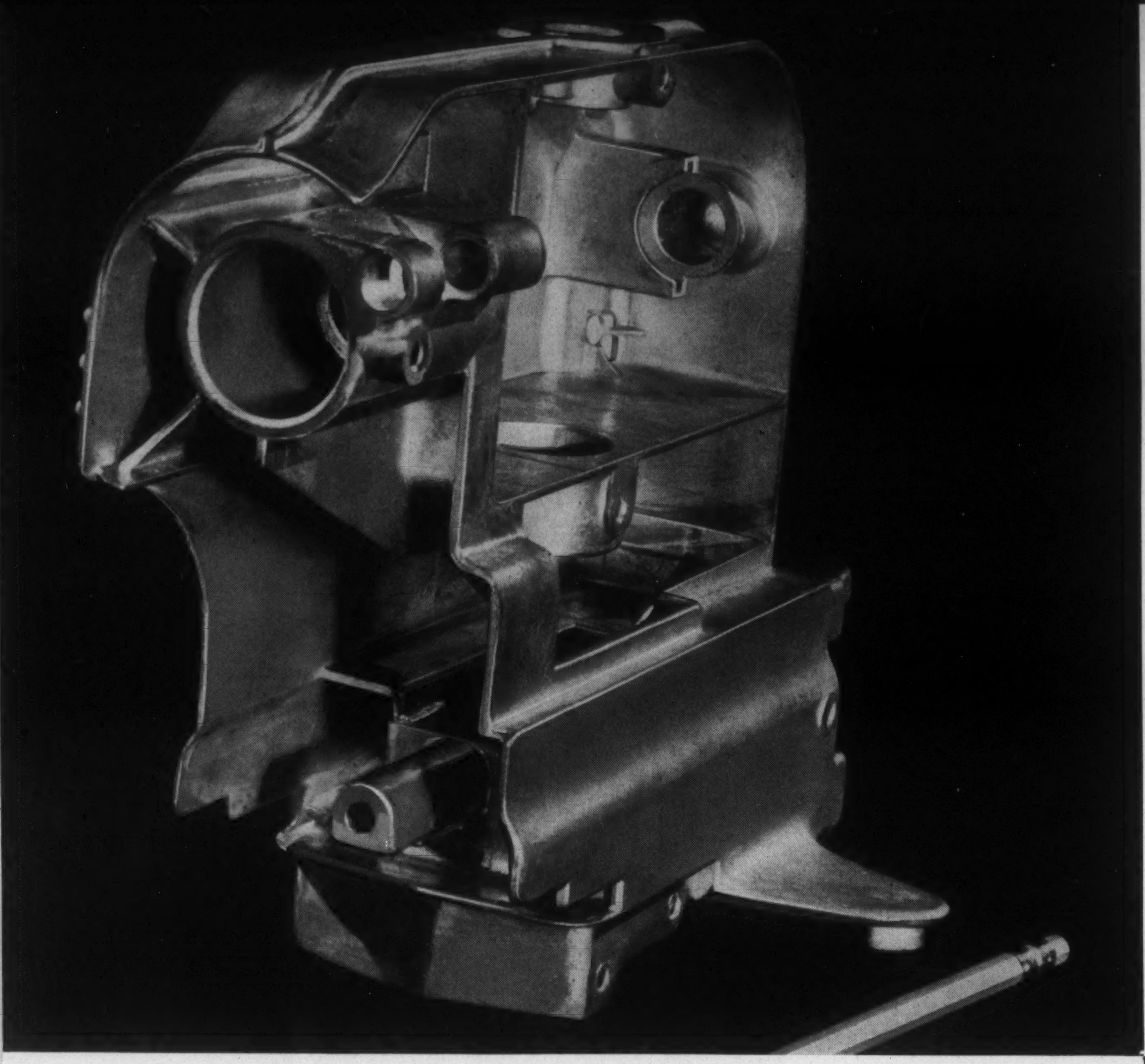
Hunter's discussion (page MA 576 R 3) of vibration of ships' propellors reminds me of the comment our youngest made years ago on a 1914 Buick we used for hunting trips—"I like to ride in Daddy's car. Always one birdie sings, and sometimes two."—H.W.G.

Residual Welding Stresses in Mild Steel

It can be shown by strain gage readings that localized heating to a white heat and subsequent cooling of a small area on a steel plate will induce stresses in the adjoining metal up to and beyond the elastic limit. Similar stresses occur in steel whenever it is worked or deformed, whether by the application of heat or mechanically. It is generally conceded that welding also induces stresses in mild steel in the weld metal and the adjacent area.

These residual welding stresses usually are not of such nature or magnitude that they constitute any serious or logical obstacle to the use of the process, however. Where welded structures are properly designed and constructed with correct procedure by qualified welding operators, residual welding stresses have been proven wholly innocent, insofar as the safety of the structure is concerned. This is amply demonstrated by the complete absence of failures of such constructions in service, resulting from locked-up welding stresses. Where required, heat or mechanical stress relieving are employed to accelerate the flow of the metal that would otherwise occur by simple aging.

Additional authoritative tests of full scale models are recommended, the results of which should enable regulatory bodies to feel justified in further relaxing their present unnecessarily severe safety requirements for certain welded constructions. This would result in a marked saving to industry as a whole. (MA 554 L 5).—E.V.D.



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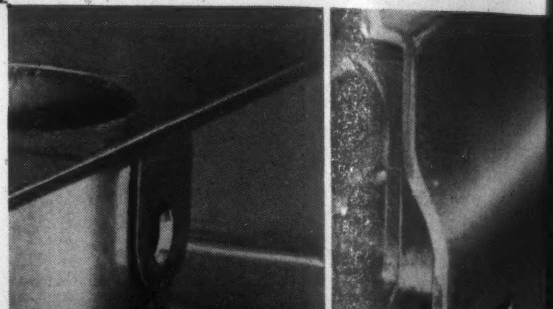

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EDITORIAL

On Writing Editorials

It always happens that in August, just when we're getting ready for September at camp in Canada, a note comes in from the New York Office saying the stock of editorials is low and some must be ground out to cover the period when we are not doing any metallurgical thinking.

It's fun to write editorials when you have something to say, and it's a satisfaction to have written one that has struck a responsive chord in some reader's mind, so that he drops us a noteabout it. There's even some satisfaction in getting a comment to the effect that a reader wholly disagrees with an editorial; it shows that somebody read it, anyhow. Much of the pleasure in the editorial work of the last eight years has been in being able to say anything we like about anything we like. But we'd add to that, it ought to be when we like. We believe it should be the custom for an editor not to fill an editorial page when he hasn't anything he particularly wants to say.

The Columbus dailies comment on the advent of the sweet corn season, the cherry pie season and so on, and do it every year. Our own category of subjects is more limited, for we're supposed to confine ourselves to things that have at least some remote connection with metallurgy. When we run out of topics ourselves, why not devote the space to "chuckles", if the readers have sent some in, or still better, to the editorial type of comment from the readers themselves? We've had "letters to the editor" in the past that we have run as editorials, since they were the editorial type of comment. We think it's a good precedent, and we'd welcome more.

We agree with the New York office that it would be proper to have an editorial page with editorials on it every month, but when the spirit doesn't move, as far as we're concerned the issue can start with the leading article. Our dog, Flash asks for bones every night, but if the butcher didn't have any that day, he either manages to get along without one, or goes and digs up one he had filed for future reference. So when we haven't any editorials, the New York office can either go without, or see what they can dig up from what the readers have provided. We wouldn't be surprised if the readers could supply much juicier bones than the editorial staff can.—H.W.G.

Duplexing, Past and Present

As a method of making steel or gray iron, duplexing has been common practice for some time. There is duplexing with the blast furnace and the open-hearth, practiced by many of the large companies. We had the privilege recently of witnessing the duplexing plant at Ensley, Ala., where blast furnace metal is blown in Bessemer converters and then taken to the open-hearth. There the silicon is kept close to 1 per cent, necessitating a short blow and hence speed in refining in the open-hearth. Steel for rails and other purposes is made with despatch and economy.

There is also duplexing with the cupola—in several ways—with the electric furnace, particularly in foundry practice; with the air furnace and with the side-blow converter. There are evidences reported that, because of certain conditions in raw material supplies, the converter may come into its own again. Much has been learned about this process for steel castings and there is no doubt but that high grade steel castings can be economically made by this process.

But the latest development in duplexing is the suggestion of a large foundry equipment firm near Chicago—hot metal from the cupola for small open-hearth furnaces. It is contended that scrap can be melted in the cupola, that an all-scrap charge can be used when conditions warrant, that half the sulphur content can be removed with soda ash at a cost of about 35 cents per ton of metal treated similar to the large scale application in England where high sulphur pig iron from a high sulphur iron ore is successfully treated, and that a hot metal can be produced at temperatures from 2700 to 2850 deg. F. leaving very little thermal work for the open-hearth. According to reports, this comparatively new application of duplexing has some prospects of adoption. In its favor is the claim that output by this method can be increased 30 per cent by installing a cupola, a desulphurizing ladle and a cradle furnace in any open-hearth plant where only cold charges are available.—E.F.C.

Devotion, Service and Profit

At the risk of being criticized for lacking breadth of outlook and vision, we are going to take issue with those professional engineers that advise young men to regard material reward for their work as merely incidental to the performance and quality of the work itself. There are many such mentors, and in their lectures and articles they stress the service element of a career, and insist that attention to the profit element is worthy only of scorn.

With their general contention that the engineer must love his work and must be able to perceive its relation to the general progress of the race we heartily agree. But all this shushing of the possibilities for personal advancement and profit seems not only a trifle unreasonable, but often insincere, inasmuch as the speaker or writer is frequently one who has built for himself a very substantial, profitable business on the quite proper professional principle that low fees are unethical and, in the declining years of his life, finds it convenient to retire with his fortune made and to reflect on the "incidental" nature of his wealth. And, why, if the historically unprecedented success of our capitalistic economy is based on the "profit motive," should the same motive not be applied to the individual's personal enterprise with analogous benefit to himself and to society?

Devotion, service and profit should be inseparably bound up in a man's work. And the last is certainly not the least of these.—F.P.P.

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CURRENT Metallurgical Abstracts

A DIGEST OF THE IMPORTANT METALLURGICAL DEVELOPMENTS OF THE WORLD

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CLASSIFICATIONS

1. ORE CONCENTRATION

Crushing, Grinding & Plant Handling (1a), Gravity Concentration (1b), Flotation (1c), Magnetic Separation (1d), Amalgamation, Cyanidation & Leaching (1e).

2. ORE REDUCTION

Non-Ferrous (2a), Ferrous (2b).

3. MELTING, REFINING AND CASTING

Non-Ferrous (3a,) Ferrous (3b).

4. WORKING

Rolling (4a), Forging & Extruding (4b), Cold Working, including Shearing, Punching Drawing & Stamping (4c), Machining (4d).

5. HEAT TREATMENT

Annealing (5a), Hardening, Quenching & Drawing (5b), Aging (5c), Malleableizing (5d), Carburizing (5e), Nitriding (5f).

6. FURNACES, REFRACTORIES AND FUELS

7. JOINING

Soldering & Brazing (7a), Welding & Cutting (7b), Riveting (7c).

8. FINISHING

Pickling (8a), Cleaning, including Sand Blasting (8b), Polishing & Grinding (8c), Electroplating (8d), Metallic Coatings other than Electroplating (8e), Non-Metallic Coatings (8f).

9. TESTING

Inspection & Defects, including X-Ray Inspection (9a), Physical & Mechanical Testing (9b), Fatigue Testing (9c), Magnetic Testing (9d), Spectrography (9e).

10. METALLOGRAPHY

11. PROPERTIES OF METALS AND ALLOYS

Non-Ferrous (11a), Ferrous (11b).

12. EFFECT OF TEMPERATURE ON METALS AND ALLOYS

13. CORROSION AND WEAR

14. APPLICATION OF METALS AND ALLOYS

Non-Ferrous (14a), Ferrous (14b).

15. GENERAL

Economic (15a), Historical (15b).

1. ORE CONCENTRATION

JOHN ATTWOOD, SECTION EDITOR

Milling Investigation into the Ore as Occurring at the Lake Shore Mine. A Summary of the More Interesting Experimental Work of the Mill Staff, from May 1933 to Jan. 1936. THE STAFF. *Trans. Can. Inst. Mining Met.*, Vol. 39, June 1936, pp. 279-434; *Can. Mining Met. Bull.*, No. 290. A compendium of data on Lake Shore ore including chemical and microscopic analysis of ore and flotation concentrates, the form and distribution of Au in mill heads and tails, the geological occurrence of the ore in relation to treatment results, treatment by fine grinding and flotation followed by separate cyanidation of the concentrate (with and without roasting) and the tails, raw treatment of the flotation concentrates from the cyanide tails, roasting tests on concentrates, roasting of original ore before cyaniding, development of direct cyanide treatment of ore, use of PbO on Lake Shore ores, high-CaO-PbO treatment (pilot plant), PbO high-CaO treatment in the main plant cyanidation circuit, laboratory treatment of mill cyanide residue, mill results and costs (recovery; relation between extraction and time of contact), method of adding chemical to cyanide circuit, Lake Shore multiple paddle agitator, short circuiting in continuous agitation, Hg bearings as applied to the 50 ft. thickener shafts, time of agitation to clean up free and exposed values, flotation of cyanide tails, relationship of cyanide tail to flotation tail in a double cyanidation flotation flow sheet, relationship between gangue values in the cyanidation and flotation tails, effect of pressure on aeration of barren solution, tube-mill aeration, relationship of finer grinding to extraction, equipment and methods used in experimental laboratory, laboratory methods of analyzing a mill residue, assay methods, method of making ore sections, undissolved free values in laboratory cyanide tails, a study of pyrite assays, a study of undissolved free values in cyanide tails, and best treatment now known for this ore. AHE (1)

1c. Flotation

Concentration of Silver from the Lead-zinc Ore of the Mammoth Mine, Silverton, B. C. W. B. TIMM ET AL. *Can. Dept. Mines, Mines Branch Rept.*, No. 763, 1936, pp. 17-22. The ratio of Zn to Pb-Ag minerals in the following ore is too great to allow high recovery of Ag by selective flotation: Au 0.005 and Ag 25.70 oz./ton, Zn 40.5, Pb 1.74, and Cu 0.22%. Approximately 65% of the Ag can be recovered in a flotation concentrate containing most of the Pb and a considerable proportion of Zn. Choice of reagent does not seem to vary Ag recovery. The main loss is with the Zn concentrate. Fine grinding of the Zn concentrate and conditioning does not cause Ag to float freely. The large amount of ZnS is the main factor governing this condition. **Copper Ore from the Eustis Mine, Consolidated Copper and Sulphur Company, Eustis, Quebec.** *Ibid.*, pp. 147-160. The ore analyzed Cu 3.90, Fe 34.80, and S 37.50%. Bulk flotation reduces reagent costs over selective flotation. Reagents used were Na silicate 2.20, amyl xanthate 0.43, pine oil 0.10, $CuSO_4$ 0.26, and CaO? lbs./ton of feed. Thickening before separation of the bulk concentrate is unnecessary. **Gold-copper Ore from the Ashloo Gold Mining Syndicate, Squamish, Vancouver Mining District, B. C.** *Ibid.*, pp. 175-181. The mill feed assays Au 0.96 and Ag 1.89 oz./ton and Cu 0.90%. Recovery of 98% of the Au can be effected by bulk flotation to give a concentrate containing Au 9.13 and Ag 16.21 oz./ton and Cu 8.30%. This can be smelted or reground and selectively floated. Tailings assay Au 0.045 and Ag 0.16 oz./ton and Cu nil. **Copper-zinc Ore from Abana Mine, Desmeloizes Township, Abitibi County, Quebec.** *Ibid.*, pp. 190-199. Bulk flotation seems to give better results than selective. Au recovery increases with amt. of pyrite floated and with fineness of grinding. AHE (1c)

1e. Amalgamation, Cyanidation & Leaching

Cyanidation of Western Australian Tailings. *Chem. Eng. Mining Rev.*, Vol. 29, Feb. 8, 1937, pp. 189-193. A series of reports of a number of investigations into tailings treatment are abstracted. The investigations include cyanidation by percolation, Wilfley table concentration and cyanidation of kaolin tailings and of cupriferous tailing. WHB (1e)

Chromium in Cyanide Solutions. H. D. BELL. *J. Chem. Met. Mining Soc. S. Africa*, Vol. 37, Feb. 1937, p. 360. Discussion. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 66L/9. AHE (1e)

2. ORE REDUCTION

A. H. EMERY, SECTION EDITOR

2a. Non-Ferrous

New Reverberatory Furnace and Waste Heat Boiler Installation. Phelps Dodge Corporation. H. A. CLARK (Copper Queen Branch). *Mining Congr. J.*, Vol. 23, May 1937, pp. 82-83, 88. Inside dimensions of the new reverberatory furnace are 107 ft. 6 in. by 26 ft. at the slag line. The charging zone is 63 ft. long with charge holes on 4 ft. centers. Drag chains are used for conveying the hot calcine. The slag skim is located 11 ft. 6 in. from the front wall, the matte tap holes in the side wall, 27 ft. 6 in. and 39 ft. 6 in. from the burner end of the furnace. Converter slag is added by means of a launder through the burner wall. There are no restrictions in area at the front end of the furnace and the uptake area is 182 ft.^{2} The furnace boiler unit is novel in that a single waste-heat boiler is located directly above the outlet of the furnace without dampers of any sort between furnace and boiler. The gases are thus delivered to the boiler at the furnace outlet temperature and the usual losses occurring in long flue connections are eliminated. Steam production is further augmented by radiated heat from the slag bath in the flue end of the furnace. The boiler, 27,186 ft.^{2} heating surface, 60 tubes wide, is designed for 400 lb. pressure and is equipped with pendant type superheater. BHS (2a)

Optimum Working Conditions of Aluminum Baths. G. A. ABRAMOV. *Metallurg*, Vol. 11, Dec. 1936, pp. 102-110. In Russian. Mathematical treatment of the conditions observed in Al electrolytic cells. See also *Metals and Alloys*, Vol. 8, May 1937, p. MA 266R/6. (2a)

Ore Treatment at the Reduction Works of the Transvaal Gold Mining Estates, Limited. C. G. BRINK. *J. Chem. Met. Mining Soc. S. Africa*, Vol. 37, Sept. 1936, pp. 116-117. Discussion. See *Metals and Alloys*, Vol. 7, Dec. 1936, p. MA 572L/9. AHE (2a)

The Production of Electrolytic Zinc and Vanadic Oxide at Broken Hill, Northern Rhodesia. O. A. E. JACKSON. *J. Chem. Met. Mining Soc. S. Africa*, Vol. 37, Sept. 1936, pp. 117-118. Discussion. See *Metals and Alloys*, Vol. 7, Aug. 1936, p. MA 396L/5. AHE (2a)

2b. Ferrous

Investigation Into the Influence of Coke Quality on Blast Furnace Operations. W. J. BROOKE, H. R. B. WALSHAW & A. W. LEE. *Engineer*, Vol. 162, Oct. 2, 1936, p. 360; Nov. 6, 1936, p. 486. Includes discussion. Extended abstract. See *Metals and Alloys*, Vol. 8, Apr. 1937, p. MA 201R/6. VSP + LFM (2b)

Equilibrium Between Carbon and Oxygen in Molten Steel and in a Gas in Equilibrium with the Steel (Om jämvikten mellan kol och syre i smält stål och i en gas, som är i jämvikt med stålet) G. PHRAGMÉN. *Jernkontorets Ann.*, Vol. 121, Feb. 1937, pp. 51-4. Polemical. HCD (2b)

Pig-iron Production. *Electrical Rev.*, Vol. 120, Apr. 16, 1937, p. 576-577. Brief description of equipment chiefly electrical, at several British blast-furnace plants. MS (2b)

The Vecchis Process for the Utilization of Pyrites Residues (Procédé de Vecchis pour l'Utilisation des Résidus de Pyrites) *Usine*, Vol. 46, Jan. 28, 1937, pp. 29-33. Descriptive. The principle of the Vecchis dressing process consists essentially in roasting and treating FeS_2 ore in such manner that the residue contains only Fe_3O_4. Roasting and combustion occur in 2 stages: $3FeS_2 + 3O_2 = 3FeS + 3SO_2$, and $3FeS + 5O_2 = Fe_3O_4 + 3SO_2$, the sum of which gives $3FeS_2 + 8O_2 = Fe_3O_4 + 6SO_2$ The formation of Fe_2O_3, which is not attacked by acids and is nonmagnetic, is avoided by keeping the temperature sufficiently high. Fe_3O_4 can be concentrated magnetically. The advantages accruing from this process and the equipment used are described and discussed at length. Ha (2b)

3. MELTING, REFINING AND CASTING

G. L. CRAIG, SECTION EDITOR

Chilling and Inverse Chilling. ICHIRO ITAKA & TAKESHI TANAKA. *Bull. Inst. Phys. Chem. Research, Tokyo,* Vol. 16, Mar. 1937, pp. 99-109. In Japanese. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 31, Mar. 1937. Abstr. Supplement, p. 13. In English. Original research. Small ingots of various metals and alloys were cast into 30 mm. diam. sand and metal molds and the hardness distribution in the ingots was checked with the Shore instrument. In many cases a gradual increase of hardness was found towards the periphery, but a chilled layer or skin effect was not observed except in the case of cast Fe poured into a chill mold. The hardness of brass and bronze was lower at the edge and in the center. The peak hardness value found between center and periphery is called "inverse chilling" and is claimed as a newly discovered phenomenon. The hardness decreases appreciably on annealing but only a little on quenching. The "inverse chilling" phenomenon was not affected by heat treatment. Densities were measured along the radii of the ingots. In ordinary cases, density increased gradually on approaching the edge. However, in brass and bronze it increased with the distance from the center and after reaching a maximum, there was a decrease on approaching the periphery. Minute invisible dendritic cavities in the inner and outer portions of the ingots are blamed for the low density and hardness values. Segregation and inverse segregation were examined by chemical analysis. EF (3)

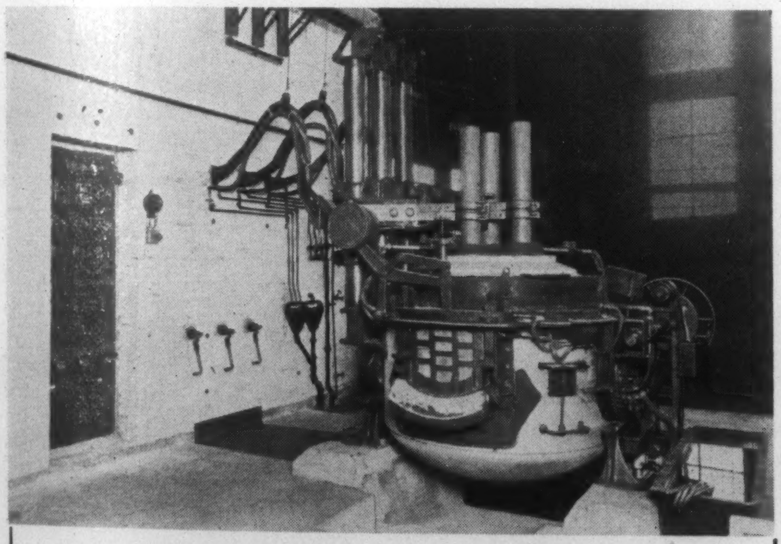
Patterns and their Relation to Moulding Problems. S. A. HORTON. *Foundry Trade J.,* Vol. 55, Dec. 31, 1936, pp. 504, 505; Vol. 56, Jan. 7, 1937, pp. 8-10. Purpose of this paper is not to discuss pattern construction, but to outline several troubles repeatedly noticed on patterns submitted. Joining of the mold, removal of the pattern from the mold, molding taper, weight of metal patterns, coring-up of the mold, contraction, dimensional accuracy and general finish, contraction, etc., are discussed. Illustrated with several sketches. AIK (3)

A Correlation of the Physical and Chemical Properties of Clays with the Durability of Molding Sands. C. E. SCHUBERT (Univ. Illinois) *Am. Foundrymen's Assoc.,* Preprint 37-3, 1937, 28 pp. Original research. See *Metals and Alloys,* Vol. 8, July 1937, p. MA 409R/2. CEJ (3)

Principles for Pattern Making Guaranteeing Simplest and Economical Production of Castings (Grundsätze für Modellanfertigung, die einfachste und wirtschaftliche Herstellung von Gusswaren gewährleistet) F. PASCHKE. *Giesserei,* Vol. 24, Mar. 12, 1937, pp. 136-138. Practical. Examples illustrate modern principles of pattern making taking into account best subdivision and arrangement of parts according to characteristics of metal used for the casting. Ha (3)

Mould and Core Drying by Modern Methods. W. H. SMITH. *Foundry Trade J.,* Vol. 56, Feb. 11, 1937, pp. 142-144. Descriptive. Most heavy general foundries could easily increase their output of castings 20 to 30% by bringing their mold drying plant up to maximum efficiency. Charging and discharging of stoves, core drying, the Acme system and cost are discussed. AIK (3)

Portland Cement as a Binder for Foundry Molding Sand. CARL A. MENZEL (Portland Cement Assoc.). *Am. Foundrymen's Assoc.,* Preprint 37-8, 1937, 17 pp. The use of a Portland cement as a binder in foundry molding sand is described. Laboratory studies of the relative influence of type of cement and cement content, moisture content, type of sand, extent of ramming, temperature and age of mix on the strength and permeability of cement-foundry sand mixtures are considered. The results obtained indicate the general feasibility of using Portland cement as a binder in molding sand and provide a basis for suggestions and recommendations for such use. CEJ (3)



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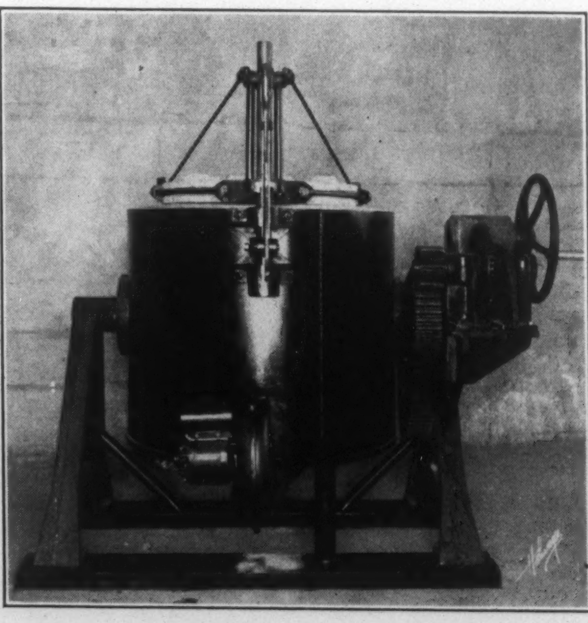

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3a. Non-Ferrous

Problems in Bronze. HAROLD J. ROAST (Canadian Bronze Co.) *Am. Foundrymen's Assoc.*, Preprint 37-28, 1937, 24 pp. Presents scattered information that is in his possession as a result of some 30 yrs. of delving into metal problems. The problems discussed are those encountered in casting. CEJ (3a)

Effect of Gases on Pore Formation in Casting of Copper Alloys (Der Einfluss von gasen auf die Porenbildung beim Giessen von Kupferlegierungen) E. RAUB. *Mitt. Forsch.-Inst. Probieramts Edelmetalle,* Vol. 11, Apr. 1937, pp. 1-10. See *Metals and Alloys,* Vol. 7, June 1936, p. MA 280R/3. Ha (3a)

The Reactions between Molten Copper Alloys and Sulphur Dioxide (Die Umsetzungen zwischen geschmolzenen Kupferlegierungen und Schwefeldioxyd) E. RAUB & A. SCHALL. *Z. Metallkunde,* Vol. 29, Jan. 1937, pp. 16-20. Original research. Molten Sn reduces SO_2 to S with the formation of SnO_2. Commercial Sn bronzes form SnO_2 and CuS, and the equilibria for different temperatures and compositions are determined. Cu-Ni alloys form NiO + NiS and equilibria are determined. Al and Al bronzes form Al_2O_3 which goes partly into solid solution. Brasses with less than 8% Zn form ZnO + Cu_2S, while with more than 12% Zn, the products are ZnO and ZnS. The ZnO slags or vaporizes while the sulphides are highly soluble. Additions of 0.2% Mg, Mn, Be, Li, Al, and P to 5% Sn alloys were studied. The amount of SO_2 taken up by the melt was increased by Li but decreased by the others, Al being the most effective. GD (3a)

Rejects in Chill-mold Castings of Light Alloys Resulting from Faulty Treatment of the Molds (Les Rebut dans les Moulages d'Alliages Legers en Coquille résultant du mauvais Traitement des Moules) SCHIED. *Rev. Fonderie Moderne,* Vol. 31, Jan. 25, 1937, pp. 23-25. Practical. Sound castings can be obtained much more conveniently by preheating the mold to about 250° C. but this preheating must be absolutely uniform. Methods of heating are discussed briefly. Ha (3a)

Significant Improvements Promise Use of More Die Cast Grills on 1938 Cars. W. J. DURING (Precision Castings Co.). *Steel,* Vol. 100, Mar. 22, 1937, pp. 34-37. Discusses recent developments and describes latest practice of Precision Castings Co. in production of grills. Machine is noteworthy for final casting pressure of 3800 lbs./in.^{2} and for locking of dies under total pressure of 2400 tons by hydraulically actuated toggle mechanism. MS (3a)

On the Production of Copper from Brass and Red Brass Scrap (Ueber die Gewinnung von Kupfer aus Messing- und Rotguss-Schrott) E. J. KOHLMEYER. *Metallwirtschaft,* Vol. 16, Feb. 26, 1937, pp. 220-224. Development. The author describes experiments on recovery of Cu from brasses wherein the recovery of Cu was 100% and all the Zn present was converted to ZnO. This is in contrast to the convertor process where a slag containing the oxides of both metals is formed. The experiments were carried out in a rotating oil-fired furnace equipped with a hood and Cottrell precipitator. A molten 60-40 brass boils at 1070° C. With vaporization of the Zn, the boiling point of the molten alloy rises, so that a melt containing 98.5% Cu and 1.5% Zn boils at 1760° C. 500 kg. of a 60-40 brass was converted to a Cu containing .25% Zn in 4-5 hrs. From 490 kg. of scrap containing 71.94% Cu, 2.72% Pb, 22.85% Zn, 2.80% Sn, .22% Fe, and .10% Ni 370 kg. of metal containing 92.98% Cu, 2.36% Pb, .74% Zn, 3.70% Sn, .03% Fe, and .15% Ni was obtained in 3⅔ hrs. Zn and Pb are removed while Sn remains. If a Cu-Sn alloy is not desired the Sn can be removed by other means. No explanation was offered for the drop in Fe content. GA (3a)

3b. Ferrous

C. H. HERTY, SECTION EDITOR

Diminution of Silicate Inclusions in High Frequency Electric Furnace Steels. K. MINATO & S. KOBAYASHI (Japan Steel Mills Co., Ltd.) *Tetsu to Hagane,* Vol. 23, Feb. 25, 1937, pp. 132-135. In Japanese. Original research. A number of alloy steels were melted in a 500-Kg acid-lined high frequency furnace. The diminution of inclusions was satisfactorily attained by the following operation: Addition of Fe-Mn (0.2-0.4%) and acid slag (1-2%) before melting of the charge, double removal of FeO-enriched slag, replacement of latter by glass or $CaO\text{-}SiO_2$ mixture during the refining, cutting off electric circuit after the last deoxidizer was added and again cutting in the circuit for a few min. before tapping. NS (3b)

The Effect on Steel of Hydrogen Absorbed in Melting (Ueber den Einfluss des beim Schmelzen aufgenommenen Wasserstoffs auf den Stahl) P. BARDENHEUER & E. H. KELLER. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch., Düsseldorf,* Vol. 18, No. 16, 1936, pp. 227-237. Review plus original research. The behavior of H in steel is reviewed. New experiments were made to determine the effect of H on the other accompanying elements in Fe. H in a steel melt does not act on C, S and P content, but a reaction occurs with the O in the melt; deoxidation of a steel melt by H is, therefore, feasible in principle. C steels containing H are "heissbruch" (hot short at 1100-1200° C.) or "rotbruch" (hot short at 800-900° C.) if C is below 0.6%. This condition can be corrected by heat treatment. Ni-Cr steels with 1% Cr and 3% Ni are "rotbruch" in forging, but not "heissbruch"; in this case, annealing at 1000° C. does not correct the defect. H absorbed by a steel melt is given off again only very slowly. Atomic H can be absorbed by steel both at normal temperature (by pickling or electrolysis) and at higher temperatures in red-hot or liquid states, but the atomic condition can last only as long as H is dissolved in the Fe-lattice. If H leaves the lattice (e.g. by passing into a hole of the ingot) molecular H is formed, which is insoluble in steel. During solidification, the ingots give off the major part of the H contained; this process is aided by hot working. The H so freed can form gaseous compounds with S, C, P and other constituents of the Fe. Notch-toughness of plain C steels is reduced by H; this reduction can be obviated by annealing. Complete details of all tests are given, with 28 references. Ha (3b)

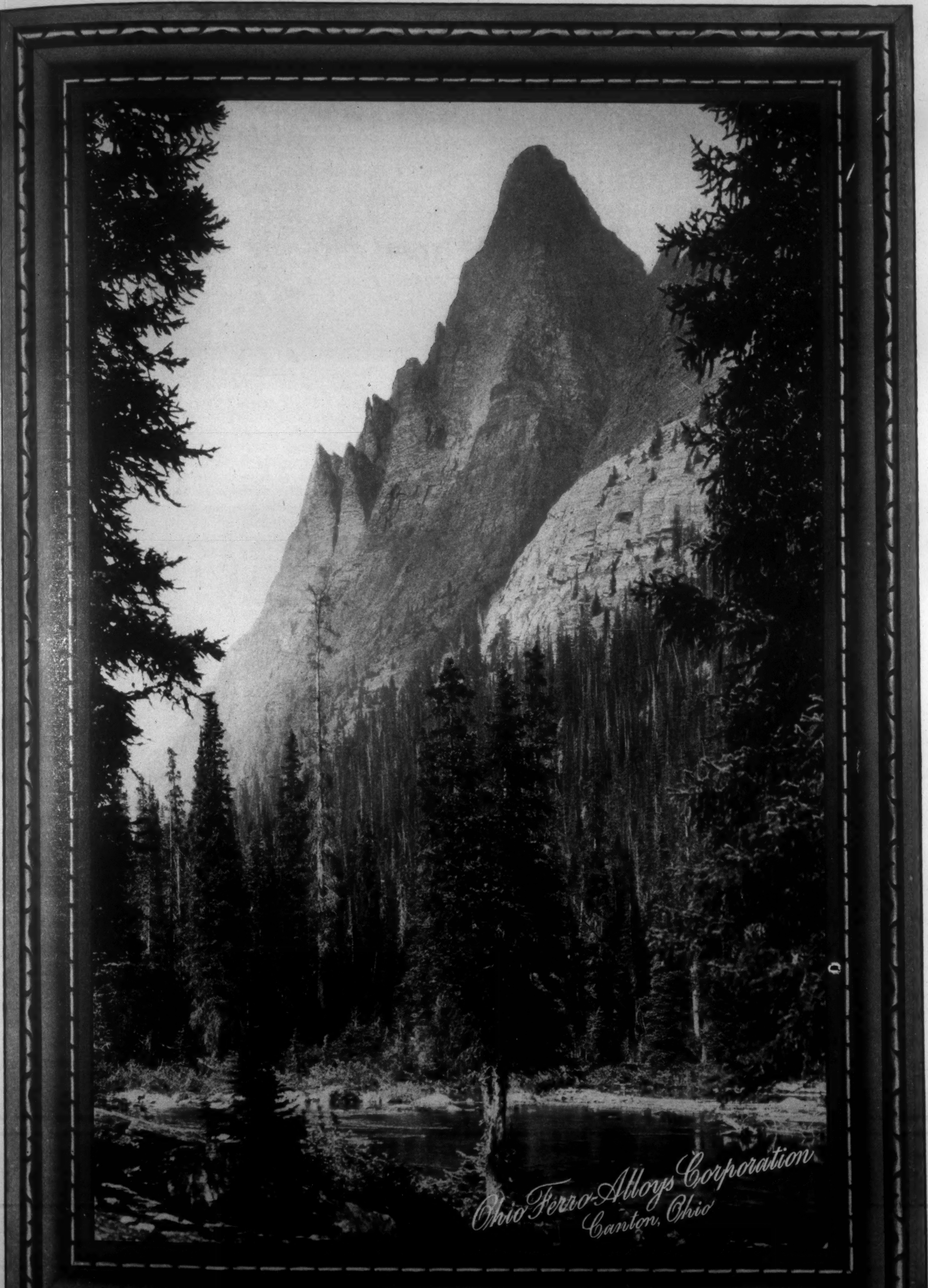
Steel Castings. J. DESCHAMPS. *Foundry Trade J.,* Vol. 56, Feb. 11, 1937, pp. 141, 144. Practical. Discusses a few problems of the art of steel founding, and refers to recent developments in molding and heat treatment of steel castings and to methods for improving their shock resistance. New molding processes mentioned include: (1) the Randupson process, in which a mixture of silica sand and Portland cement is used. The molds obtained from this mixture are dried in air, and it is possible to produce fairly large castings without the use of molding flasks. (2) The use of a mixture of silica sand, linseed oil and manganese dioxide, which is applied lightly without any ramming on the patterns, and, while developing great hardness through being dried in air, has the property of becoming quite soft and collapsible after having been in contact for a short time with liquid steel, thereby yielding easily to the stresses induced by the solid contractions of the metal. With very large risers on heavy steel castings, the amount of liquid steel required for feeding purposes may be reduced by using a "portable electric furnace" applied to the top of the risers. The heat generated by an electric arc struck between an electrode and the metal in the riser maintains (even raises) the temperature of the steel in the risers. Liquid and solid contractions, cleaning steel castings and heat treatment are also discussed. AIK (3b)

Influence of Elements on Cast Iron. *Foundry Trade J.,* Vol. 56, Feb. 18, 1937, pp. 159-160. Extended abstract of a lecture by A. E. Peace. Effect of graphite, S, Mn, S, P, Ni, Cr, Mo, Va and Cu on cast Fe are discussed. AIK (3b)

Summary of Second Report of the Steel Casting Research Committee Special Report No. 15, 1936, The British Iron and Steel Institute. C. W. BRIGGS (U. S. Naval Res. Lab.) *Am. Foundrymen's Association,* Preprint 37-16, 1937, 14 pp. See *Metals and Alloys,* Vol. 8, June 1937, p. MA 346R/5. CEJ (3b)

The Perrin Refining Process (Staatsraffinage volgens Perrin) M. H. CARON. *De Ingenieur,* Vol. 51, July 17, 1936, pp. M21-M28. Complete description of the Perrin process in which P or O is removed from the metal bath almost instantaneously, by treating the metal from the converter or from the open-hearth with synthetic slags which form an emulsion with the metal bath. By this process no fine inclusions can remain in the metal bath as is the case with the addition of Al as deoxidizer. Soft C steel can thus be produced, rimmed steel without addition of Al or Si. All reactions in the different stages of the process and furnaces used are described in full, and curves of the progress of refining with time are given. The author states in his résumé that this process will make possible the production of steel of definite properties without the need for mechanical tests. Ha (3b)

Basic Open-hearth Slag an Important By-product at the Ensley Works. R. L. BOWRON (Tenn. Coal, Iron & Railroad Co.) *Mining and Met.,* Vol. 18, Apr. 1937, pp. 198-199. Brief description of the practice at the Ensley works of the Tenn. Coal, Iron & R. R. Co., where basic slag for agricultural purposes is an important by-product in the manufacture of Fe and steel. Product is marketed as "Ground Open-hearth Basic Slag," with a P_2O_5 content from 8-12% and a fineness of 80% through a 100-mesh screen. VSP (3b)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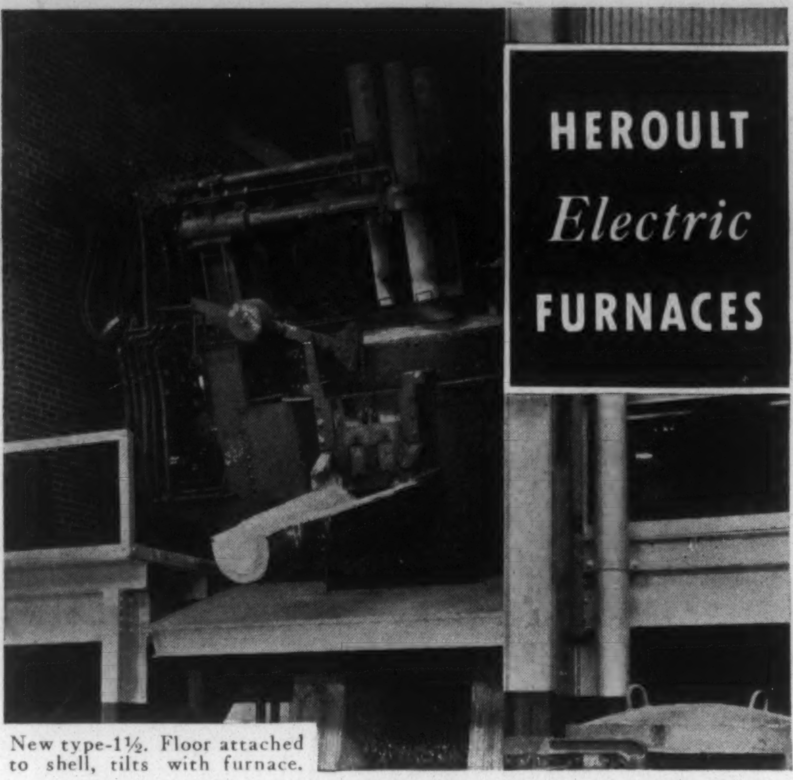

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UNITED STATES STEEL

Sulphide Inclusions in Iron and Steel and their Equilibria (Sulfidinneslutningar i järn och stål ur jämnviktssynpunkt) HELGE LÖFQUIST. *Tek. Tid.*, Vol. 67, May 8, 1937 (Section *Bergsvetenskap*) pp. 37-44. Slag inclusions in iron and steel, particularly sulphide inclusions, according to some investigators, precipitate during the solidification of the metal. This theory, which probably is correct, assumes an appreciable solubility of the slag in the molten metal. It is now known that a sulphide slag is quite soluble in molten steel, but that the solubility in the solid metal is very low. It is therefore possible to follow the formation of the slag through systematic studies of equilibrium diagrams. The following diagrams are discussed: Fe-FeS; Fe-S-C; Fe-S-O; Fe-Mn-S; Fe-Mn-S-C; Fe-Mn-S-C-P; Fe-Mn-S-C-Si; Fe-Mn-S-O; FeS-C-Si; Fe-S-P; and Fe-S-C-P. Many important illustrations in connection with practical steel metallurgy are given, and typical examples of sulphide inclusions are discussed. It is, for instance, shown how an O_2 content equivalent to the S contained in the melt will completely change the nature of the sulphide inclusions. In a material low in O_2 the sulphides will occur as eutectic particles on the grain boundaries of the Fe; in materials of higher O_2 content, on the other hand, the sulphides, together with oxides, occur in drop shaped inclusions, and mainly within the grain structure of the Fe itself. This is an advantage in many cases, in other words, O_2 has a beneficial effect upon the sulphide inclusions. Slag particles, high in O_2 and CaO will tend to reduce both the S and P content of a heat, whereas too strong deoxidation with Al results in sulphide bands and streaks on the grain boundaries which affect the physical properties adversely. BHS (3b)

Developments in the Production of Ingot-mould Castings. ROBERT BALLANTINE. *Foundry Trade J.*, Vol. 56, Jan. 7, 1937, pp. 3-5; Jan. 14, pp. 25-27, 32. Practical. Developments in the production of ingot-mold castings discussed. Use of ingot molds, mold types, cores, core drying, design of molds, weight ratios and lives, metals and melting, analysis, manufacture, etc., are covered. The following analysis is recommended by Swinden and Bolsover: T.C, 3.5-3.75%; C.C, 0.3-0.6%; Si, 1.9-2.3%; Mn, 0.6-1.0%; S, 0.03-0.05% and P, 0.03-0.045%. There is also a tendency to limit Si to 1.7 or 1.9% with a higher Mn content of 0.9-1.1%. Other investigators, including the author, believe that fairly wide variances in composition are permissible. Si at 1.8% and Mn not exceeding 0.9% with minimum S and P, give good results. AIK (3b)

The Cause of Pinholes in Cast Steel (Les Causes des Piqûres in Cast Steel) M. GUÉDRAS. *Rev. Fonderie Moderne*, Vol. 31, Mar. 10, 1937, pp. 74-75. Review. The "pitting" of the surface of steel castings is discussed. Causes can be a moist mold, lack of air draft, badly subdivided and too long flow of metal, air bubbles in the flow, too hard molds (causing boiling), and poor-quality sand. Addition of ½ to 2 lbs. Al per ton of metal has been recommended, but the German practice of keeping a pocket of slag over the metal seems preferable in the avoidance of pinholes. Ha (3b)

Cupola Hot Metal Duplexing for the Electric Steel Foundry. H. B. KINNEAR & H. W. GILLETT (Battelle Mem. Inst.) *Metals and Alloys*, Vol. 7, Dec. 1936, pp. 301-308. Survey of duplexing methods suitable for intermittent use in the production of a great variety of compositions. Steel scrap with additional pig Fe is melted in hot blast cupola furnace. The Se is removed by soda ash treatment, preferably in preheated forehearth. After transferring the metal to a 4 ton basic electric furnace the carbon is reduced by adding ore or mill scale. The process minimizes the electric energy required and reduces the maximum demand. GEG (3b)

The New Foundry of David Brown & Sons, Limited. VINCENT C. FAULKNER. *Foundry Trade J.*, Vol. 56, Jan. 28, 1937, pp. 97-101. The Fe foundry, the Randupson process, closing the molds, steel foundry, patternshop and laboratories are described. The Randupson process of cement molding differs essentially from the normal dry sand process, in that the drying of the mold is not affected by the evaporation of the moisture, but by definite chemical reaction. No molding flasks are used. The importance of correct ramming is greatly diminished, for, whether the face of the body of the mold is rammed hard or soft, it will after setting give a surface entirely resistant to metal. The permeability of the mold is very much higher than is normally encountered in orthodox practice. It is easy to blow tobacco smoke through the mold material when set. The sand used consists of silica sand, of suitable grading as regards sieve analysis mixed with from 8 to 15% of cement and 4 to 10% of water. The mixture is varied to some extent, depending upon the nature of the castings to be produced, and the type of the mold being made. AIK (3b)

Mass Production of Railway Steel Castings in Canada. E. G. FIEGEHEN. *Foundry Trade J.*, Vol. 56, Feb. 11, 1937, pp. 137, 138, 140; Feb. 18, pp. 157, 158; Feb. 25, pp. 175, 176; Mar. 4, pp. 190, 191. Describes completely the production of railway wagons in one of the largest railway rolling-stock plants in Canada. A production of 150 side-frame castings is secured during a 10-hr. shift. The conditioned sand supplied to the molding machines is of high permeability, and the ramming produces an even density. Wherever possible, metal patterns and core-boxes are used to ensure a mechanical accuracy. The permeability, moisture content, bond and green strength of the sand supplied are subject to a continuous check by the sand-testing office. The paper is well illustrated with photographs and diagrams. AIK (3b)

Malleable Iron and Shrinking (Malléable et Retassure) CH. KLUIJTMANS. *Rev. Fonderie Moderne*, Vol. 31, Feb. 25, 1937, pp. 61-63. Practical. The difficulties of making a correct mold for malleable castings due to the very short interval of solidification are discussed. Practices in different countries to avoid intercrystalline cracks usually connected with shrinking in this material are described. By proper shaping of the mold and arranging of gates and risers defective castings can be avoided. Ha (3b)

Basic Open Hearth Process. H. L. GEIGER. *Steel*, Vol. 100, Mar. 29, 1937, pp. 38-41, 80-82; Apr. 5, 1937, pp. 39-42, 44; Apr. 12, 1937, pp. 64, 66, 68; Apr. 26, 1937, pp. 48-50, 52, 78, 80-81. Discusses origin, early development, present-day open-hearth furnace, making of a heat of steel (in the form of a log), various reactions taking place, and control of the reactions. MS (3b)

Cupola High Test Cast Iron. R. S. MACPHERRAN (Allis-Chalmers Mfg. Co.) *Am. Foundrymen's Assoc.*, Preprint 37-19, 1937, 7 pp. Defining high test cast Fe as Fe having over 50,000 lbs./in.^{2} tensile strength, the procedure used in one foundry to produce such metal is described. Test bars and factors affecting test results are considered. Duplexing is briefly discussed. CMS (3b)

Sand Control in a Malleable Foundry. E. C. ZIRZOW (Nat. Malleable and Steel Castings Co.) *Am. Foundrymen's Assoc.*, Preprint 37-2, 1937, 22 pp. A detailed description is given of sand control as practiced in the plant with which the author is connected. 11 charts present data on properties as variations over stated periods. CMS (3b)

4. WORKING

Kinetics of Plastic Deformation of Crystals (Die Kinetik der plastischen Deformation von Kristallen) M. KORNFELD (Phys. Tech. Inst. of Ural) *Physik. Z. Sowjetunion,* Vol. 10, No. 5, 1936, pp. 605-617. In German. Theoretical and experimental research. A method for investigating the kinetics of the plastic deformation of crystals has been selected and definition of the plastic properties of a crystal has been introduced. Preliminary results are presented illustrating the nature of the testing method. Problems of future investigations are pointed out. The conceptions of Polanyi & Schmid (Naturwissensch., Vol. 17, 1929, p. 301) on "thermal and athermal" plasticity of crystals have been further advanced. EF (4)

4a. Rolling

S. EPSTEIN, SECTION EDITOR

The Hot Rolling of Medium Carbon Steel (Vorgänge beim Warmwalzen von mittelharten Kohlenstoffstählen) W. LUEG. *Stahl u. Eisen,* Vol. 57, Apr. 1, 1937, pp. 349-354. A summary of an extensive study at the Kais. Wilh. Inst. Eisenforsch. The resistance to deformation and roll pressure sharply decreased with rising temperature of the work, but spreading was not affected by temperature. Increasing the ratio of thickness of the rolled work to roll diameter greatly decreased the resistance to deformation; a four-fold increase in the ratio halved the resistance. Higher C steels required somewhat greater roll pressures and showed greater resistance to deformation at lower rolling temperatures. At higher temperatures the effect of C content was hardly observable. Finishing temperatures of about 800-900° C. gave the best mechanical properties. The reduction per pass and thickness of work had practically no effect. See also *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 74L/3. SE (4a)

Mechanics of Cold Rolling. W. TRINKS. *Blast Furnace Steel Plant,* Vol. 25, Mar. 1937, pp. 285-288. Theoretical. Reviews the Siebel theory and offers modifications to make it applicable to practical purposes. Treats of cumulative effect of pressure upon the friction hill; flattening of rolls by pressure and resulting increase of contact length; and effect of front and back tension on roll flattening and roll pressure. MS (4a)

Production and Quality Control of Sheets for Automobile Body Fabrication. T. F. OLT (Am. Rolling Mill Co.) *Trans. Am. Soc. Mech. Engrs.,* Vol. 59, Apr. 1937, pp. 185-195. *Iron Age,* Vol. 139, June 3, 1937, pp. 50-53, 122, 124, 126. Recent and older methods of rolling wide, mild steel drawing sheets are compared and present methods of control of manufacturing processes described. 12 references. Ha (4a)

Steelworks Auxiliary Drives. H. NIELSEN (General Elec. Co.) *Electrical Rev.,* Vol. 120, Apr. 23, 1937, p. 618-619. Discusses merits of a.c. and d.c. supply for auxiliary drives for rolling mills, and roller table drives. MS (4a)

Electrical Equipment of Wide-strip Mills. W. E. TAYLOR (Metropolitan Vickers Elect. Co.) *Electrical Rev.* Vol. 120, Apr. 23, 1937, p. 614-615. Descriptive. Gives particulars of mills installed in the United States. MS (4a)

Reversing Rolling Mill Drives. H. S. CARNEGIE (English Elect. Co.) *Electrical Rev.,* Vol. 120, Apr. 23, 1937, pp. 612-613. Discusses factors to be considered in design. MS (4a)

Study of Continuous Rolling of Tubes. A. CHEKMAREV, P. EMELYANENKO & A. SHEVCHENKO. *Teoria i Pract. Met.,* No. 1, 1937, pp. 41-49. In Russian. Study of operation of a Fasl mill showed that many undesirable factors are present in the practice adopted in the plant investigated. See *Metals and Alloys,* Vol. 7, Jan. 1936, p. MA 8R/1. (4a)

Twin Drives for Rod-rolling Mill. *Engineering,* Vol. 143, Apr. 9, 1937, p. 415. Brief description with illustration of a modern drive manufactured by Messrs. David Brown and Sons (Hudd.), Limited, Huddersfield, England. LFM (4a)

Manufacturing Sheet and Strip. *Electrical Rev.,* Vol. 120, Apr. 23, 1937, pp. 609-611. Describes electrical drives and other equipment of several British sheet and strip mills. MS (4a)

4b. Forging & Extruding

A. W. DEMMLER, SECTION EDITOR

Progress in Handling Large Forging Billets. A. J. G. SMITH. *Heat Treating Forging,* Vol. 23, Apr. 1937, pp. 178-179. Describes automatic floor machines for furnace charging and manipulation under the hammer. MS (4b)

Drop Hammer Design and Construction. MACDONALD S. REED (Erie Foundry Co.). *Heat Treating Forging,* Vol. 23, Mar. 1937, pp. 122-126. Review. Discusses improvements in design that have been made, and causes and effects of the changes. MS (4b)

Investigation of the Forging Process. H. HOUBEN. *Metal Treatment,* Vol. 2, Winter 1936, pp. 194-197. **Untersuchungen über die Vorgänge beim Schmieden.** H. HOUBEN. *Arch. Eisenhüttenw.,* Vol. 10, Nov. 1936, pp. 183-187. The pressure set up, the deformation of the work, and the duration of the forging pressure were measured optically and recorded photographically. Results during cold forging such materials as Pb are shown. JCC + SE (4b)

4c. Cold Working — Shearing, Punching, Drawing & Stamping

High Tensile Cap Screws Made from Low Carbon Steel Cold Drawn at the Header. F. W. GAINES (Ajax Mfg. Co.). *Wire & Wire Prod.,* Vol. 12, Mar. 1937, pp. 141-143. Practical. Tests of the possibility of making high-tensile, unheat-treated bolts and cap screws from a low C steel are described. Results show that it is quite possible to control the tensile strength right at the header; with increasing draft the tensile strength of the finished product is also increased. Age-hardening was very noticeable; 10 days after being threaded the tensile strength had increased from 107,900 to 116,100 lb./sq. in. Ha (4c)

4d. Machining

H. W. GRAHAM, SECTION EDITOR

The Cutting Temperature in the Turning Process and Its Application as Characteristic for Chippability (Die Schnittemperatur beim Drehvorgang und ihre Anwendung als Zerspanbarkeitskennziffer) H. SCHALLBROCH & H. SCHAUMANN. *Z. Ver. deut. Ing.,* Vol. 81, Mar. 13, 1937, pp. 325-330.Original research. The possibility of determining the temperature of the cutting edge very accurately by a thermocouple had shown that a close relationship exists between cutting temperature and the other factors of the chipping process, and that it is possible, by means of this cutting temperature, to characterize individually both material to be cut and cutting tool. The temperature produced in chipping a certain material at a given cutting speed can be considered as a characteristic property, and the temperature which a tool can stand during a certain length of time T can be considered as a characteristic value for the tool material. Curves are reproduced for different tools and materials, and it is shown how tables can be made up for machining operations in the shop on the basis of such curves. 15 references. Ha (4d)

Cutting Tools for Silumin (Schneidwerkzeuge für Silumin) J. DORNAUF. *Aluminium,* Vol. 19, Mar. 1937, pp. 187-193. The best shapes for cutting, drilling, milling, sawing and finishing tools are described, and a table is given for cutting velocity and feed for the various kinds of machining. Types of coolants and lubricants are discussed. Ha (4d)

Suitable Oils for Automatic Machining of Light-metal Alloys (Geeignete Oele für die Bearbeitung von Leichtmetall-Automaten-Legierungen) K. BEUERLEIN. *Aluminium,* Vol. 19, Mar. 1937, pp. 175-176. Light metals are machined using either cooling oils mixed with water, or pure lubricating oils. The ratio of oil to water is generally above 1:20. A special centrifugal cleaner for oil, to remove even the smallest metallic particles, is described. Ha (4d)

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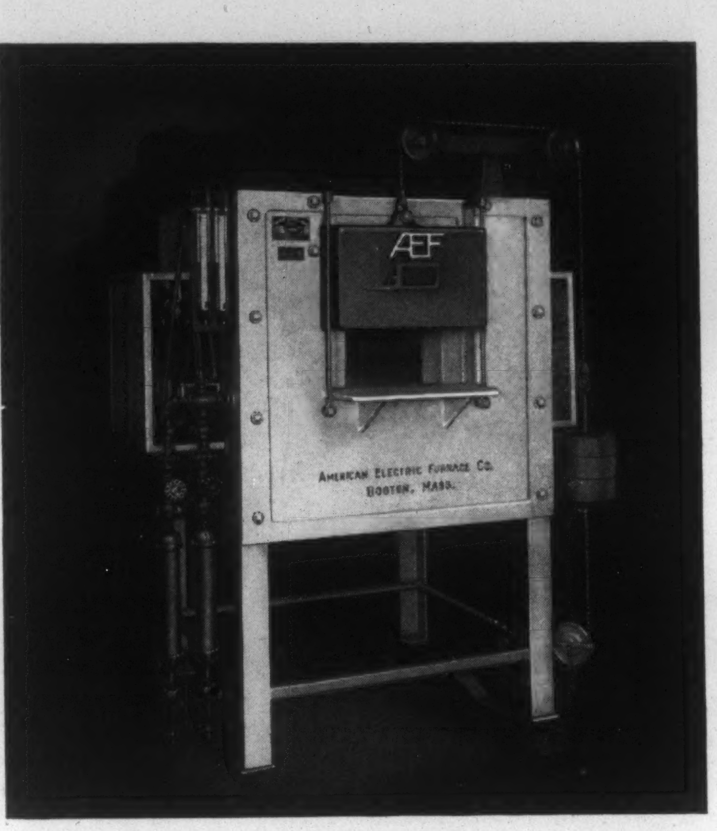

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5. HEAT TREATMENT

O. E. HARDER, SECTION EDITOR

New Ferrous Alloys and Treatment. *Engineer,* Vol. 163, Jan. 29, 1937, pp. 138-139. Descriptive. Follsain, Metals Ltd., of Wycliffe Foundry, Lutterworth, England, have perfected some new processes for producing corrosion- and heat-resisting metals which are less expensive than alloy steels with such properties. In the H. T. process the article to be treated is placed in a box and a special powder is packed tightly around the article and the whole is heat treated for a period of days. It is claimed that the outer section of the metal is converted to the required depth into a new Al, Si, Cr ferrous alloy by means of diffusion of some of the compounds of the special powder. This new metal resists oxidation and the attack of sulphurous gases or a carburizing atmosphere if the temperature of the metal is not higher than 1000° C. to 1050° C. All steels and cast Fe of low graphite content can be treated but the method is not successful for ordinary cast Fe. The company also makes an alloy called C.Y. alloy which is abrasion resisting and E.V. alloy which is corrosion resisting. E.V.H. 1, a Ni-Cr alloy is resistant to oxidation, sulphurous and other furnace gases. All these alloys are claimed to have good mechanical properties. No chemical compositions are given of the alloys or of the special powder. LFM (5)

Heat Treatment of Steel Castings. ROBERT HUNTER. *Foundry Trade J.,* Vol. 56, Mar. 11, 1937, pp. 213, 214, 216; Mar. 18, pp. 237, 238, 240. Up-to-date review. Reasons for heat treatment, release of internal stresses, refinement of cast structure, temperature determination, heat-treatment of low alloy steel castings, nickel steels, chromium steel castings, nickel-chrome castings, and heat-treatment of stainless steels are discussed. Although with C steels it is customary to give the castings a preliminary grain-refinement treatment before hardening and tempering, this is not always done with alloy steels. To obtain the best mechanical tests with alloy steels the preliminary treatment is recommended, although not always is the enhancement of properties so obtained justified on economic grounds. AIK (5)

The Hot-working and Heat Treatment of Carbon Tool Steels. R. A. MALMBERG (Jessop Steel Co., Washington, Pa.). *Ind. Heating,* Vol. 4, Jan. 1937, pp. 22-24; Feb. 1937, pp. 101-104, 116; Mar. 1937, pp. 193-196; Apr. 1937, pp. 267-270. Review. The various terms used in heat treatment are defined and the correct procedures for hot-working and heat treating of C tool steel, for forging, annealing, hardening and tempering discussed. Present views on the mechanism of hardening, influence of temperature, heating and cooling time on metallurgical structure and on mechanical properties are described and practical suggestions given. Ha (5)

5a. Annealing

Localized Annealing of Cartridge Shells by Induction (Le Recuit partiel Automatique des Étuits de Cartouches par Induction) R. SEVIN. *J. Four Elec.,* Vol. 46, Mar. 1937, pp. 89-91. Practical. Portion of the shell retaining the bullet must be annealed within very limited specifications to be satisfactory for use. This can be well done by using induction heating. An apparatus for treating 5,400 shells per hr. is described in some detail. JDG (5a)

Change of Internal Stress and Microstructure in Cold Twisted Metals Due to Annealing. TARO UEDA (Osaka Imp. Univ.). *Tetsu-to-Hagane,* Vol. 23, Feb. 25, 1937, pp. 145-152. See *Metals and Alloys,* Vol. 7, Aug. 1936, p. MA 402L/1. NS (5a)

5b. Hardening, Quenching & Drawing

Improvement of the Physical Properties of Cast Fe by Quenching and Drawing (Amélioration des Caractéristiques Mécaniques de Fontes Fines Moulées, par Trempe et Revenu) OLINGER & GUILLEMEAU. *La Fonte,* No. 21, May-June 1936, pp. 808-811. Oil quenching from 825° C. and drawing at 400° C. and 500° C. improved strength properties of 2 cast irons. The electric furnace Fe had a lower total C content and gave better results than the cupola metal. WHS (5b)

Austempering. E. S. DAVENPORT (United States Steel Corp.). *Heat Treating Forging,* Vol. 23, Apr. 1937, pp. 170-173, 177. **Heat Treatment of Steel by Direct Transformation from Austenite.** *Steel,* Vol. 100, Mar. 29, 1937, pp. 42-45. Discusses principle and limitations of the process and gives properties of steel so treated. Steel is heated to an appropriate temperature above the critical range to render it austenitic, and then is transferred rapidly to a quenching bath maintained at some predetermined, constant temperature below the critical range but above 300° F. It is held at this temperature for a predetermined time to insure complete direct transformation from austenite to final product. Material may then be cooled to atmospheric temperature in any convenient manner. Produces in C steel high hardness coupled with high degree of toughness and ductility. MS (5b)

Multiple Tempering of High Speed Steel. FRANCIS W. ROWE (David Brown & Sons). *Metal Progress,* Vol. 31, Apr. 1937, pp. 416, 446, 448. Reports data showing lower as-quenched hardness with increased temperature of quench. On tempering the highest hardness in tempered condition occurs where the as-quenched hardness was lowest. 18-4-1 quenched from 2460° F. and tempered at 1005° F. shows Rockwell C 63.9 as-quenched, increasing with time of draw to 68 in 6 hrs. WLC (5b)

Precipitation Hardening of Aluminum Castings (Die Ausscheidungshärtung von Aluminiumgussstücken) A. VON ZEERLEDER (Alum. Ind. A. G.). *Aluminium,* Vol. 19, Feb. 1937, pp. 53-57. Review. The mechanism of precipitation hardening is briefly explained. An Al casting alloy must have a very fine grain to be precipitation-hardenable; this can be obtained by quick cooling in solidification, and the casting should have thin walls; for larger sections quenching plates should be used. The casting must be heated as close as possible to the solidus point, preferably in salt baths. 4 references. Ha (5b)

New Type of Gear Hardening Machine Developed. *Heat Treating Forging,* Vol. 23, May 1937, pp. 231-233. Describes unit developed by the Farrel-Birmingham Co., Buffalo, N. Y., for hardening double helical gears. It uses 4 torches to harden both sides of both helices simultaneously. MS (5b)

Hardening and Tempering of Cast Iron. J. E. HURST (Inst. Brit. Foundrymen) *Iron Age,* Vol. 139, May 14, 1937, p. 74B. See *Metals and Alloys,* Vol. 8, June 1937, p. MA 354R/1. VSP (5b)

What Process for Wear Resistance? MILES C. SMITH. *Am. Machinist,* Vol. 81, May 5, 1937, pp. 365-366. General discussion of methods to increase surface wear resistance. Ha (5b)

5d. Carburizing

Rapid Malleabilizing of Iron. O. MANASERIAN & YA. BEZMENOV. *Liteinoe Delo,* Vol. 8, 1937, pp. 29-35. In Russian. Original research. A long series of experiments showed that by quenching white Fe castings in oil from 850-900° C. or in air when the sections are not greater than 6 mm. the time required for malleabilization can be reduced considerably. The optimum malleabilizing cycle recommended involved heating to 950° C., soaking at the temperature for 3-6 hrs., cooling to 760° C., soaking for 6-8 hrs. and cooling with the furnace. This produces normal malleabilized structure with very finely divided temper C. (5d)

5f. Nitriding

Favorable Interior Compressive Strains in Nitriding Layers (Günstige Druckeigenpannungen in Nitrierschichten) F. GENTNER. *Tech. Mitt. Krupp,* Vol. 5, Feb. 1937, pp. 19-21. Original research of unusual precision. The phenomenon of volume increase of nitrided surface layers was studied. In the nitrided layer compressive forces occur which may reach 27,000 lbs./in.^{2}, especially for larger sections. The system of interior stresses thus formed must, however, be considered as favorable as they improve, in hard materials, the fatigue strength in hard materials and the corrosion fatigue strength in soft. Methods of producing artificially a system of interior stresses have been developed before, but in the nitriding process, this effect is a natural by-product. 3 references. Ha (5f)

Accelerators for Surface Nitriding (Beschleunigungsmittel für die Oberflächen-Nitrierhärtung) *Oberflächentech.,* Vol. 14, Feb. 2, 1937, pp. 27-28. Methods of shortening the time of nitriding are reviewed. Mixtures of NH_3 and NO, metals, both ferrous and non-ferrous, as catalyzers in the nitriding atmosphere, halogens, and N-containing organic compounds are discussed. Ha (5f)

6. FURNACES, REFRACTORIES AND FUELS

M. H. MAWHINNEY, SECTION EDITOR

Insulating Refractory Brick—Their Properties and Application A. V. LEUN (Bethlehem Steel Co.) *Am. Foundrymen's Assoc.,* Preprint 37-23, 1937, 13 pp. *Ind. Heating,* Vol. 4, June 1937, pp. 464-470. Review. The use of insulating brick in furnace construction allows for thinner walls than when using fireclay brick, besides resulting in excellent fuel economies. Suggestions are given for the proper choice of brick in order to increase furnace efficiency. CMS + Ha (6)

High-capacity Pusher Furnaces (Hochleitungs-Stossöfen) A. SPRENGER. *Z. Ver. deut. Ing.,* Vol. 81, Mar. 20, 1937, pp. 357-359. Recent developments to increase the capacity of pusher furnaces by water-cooled slides and their economy are described. Ha (6)

Rammed Refractory Materials. M. MUGNEROT. *Foundry Trade J.,* Vol. 56, Jan. 14, 1937, pp. 21-23. General review. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 152L/7. AIK (6)

Some Recent Gas Furnace Developments and Installations. H. M. HEYN. *Heat Treating Forging,* Vol. 23, Jan. 1937, pp. 40-44. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 80R/1. MS (6)

New Alloy Extends Range of Electric Heat Application. H. E. KOCH (Hevi Duty Electric Co.). *Elec. World,* Vol. 107, Jan. 16, 1937, pp. 32-34. **Development of Alloy 10.** IBID. *Heat Treating Forging,* Vol. 23, Mar. 1937, pp. 141-145, 148. Composition and suggested applications of Smith Alloy No. 10. See *Metals and Alloys,* Vol. 7, Mar. 1936, p. MA 147L/9. CBJ + MS (6)

Fuel Economy in Melting and Reheating Furnaces. R. J. SARJANT. *Iron & Coal Trades Rev.,* Vol. 134, May 14, 1937, p. 889; May 21, 1937, pp. 927-928. With discussion. The factors governing fuel economy of different types of furnaces, problems of combustion control in connection with heat transfer, and heat storage and heat insulation are discussed. Ha (6)

Annealing Time for Malleable Is Reduced to 45-50 Hours. EDWIN BREMER. *Foundry,* Vol. 65, May 1937, pp. 42-43, 133-134. Describes an elevated electrically heated furnace, and cycle whereby metal charge is removed from furnace to promote rapid cooling during part of annealing, which results in shortening the period. The furnace is a batch-type used by the Wagner Malleable Iron Co. Gives results obtained with the furnace. VSP (6)

Thermal Conductivity of Commercial Silicon Carbide Bricks (Die Wärmeleitfähigkeit technischer Siliziumkarbidsteine) FRITZ HOLLER (Tech. Hochschule Aachen). *Wärme,* Vol. 60, Apr. 17, 1937, pp. 245-251. Heat conductivity of highly refractory Si-C bricks increases with increasing purity of Si-C raw material, with decreasing additions of clay, with use of caustic magnesite in lieu of clay as binding agent, with decreasing porosity and with lower firing temperatures. EF (6)

Methods for Testing Refractories. III. The Temperature of Incipient Softening According to the Methods of the C.T.I. and the DIN (Sui Metodi di collaudo dei materiali refrattari. III. La Temperature di inizio di rammollimento secondo le Norme C.T.I. e DIN) L. BELLADEN (Royal Genoa Univ.). *Met. Ital.,* Vol. 19, Feb. 1937, pp. 55-57. Investigation of the cause of discrepancies in determinations made according to the Italian, C.T.I. (Comitato Termotecnico Italiano) and the German, DIN (Deutsche Industrie Normen) test methods. The Italian test specifies that the temperature of incipient softening shall be taken as the temperature when the test piece is 0.3 mm. shorter than its length at the temperature of inversion, this height to be measured directly. The German method takes the temperature of incipient softening from the chart drawn by the testing machine at the point 3 mm. below the max. on the curve. An inspection of the curve shows that the Italian method gives a lower temperature reading in most cases, except for siliceous refractories having a narrow melting range. See also *Metals and Alloys,* Vol. 7, July 1936, p. MA 352L/9. AWC (6)

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Modern Electric Melting Furnaces (Neuzeitliche Elektroschmelzöfen) W. JAEKEL. *Chem. App.*, Vol. 24, Mar. 1937, 5 pp. Up to date review. The latest developments in the field of high and low frequency melting furnaces for steel, non-ferrous metals and corundum are discussed and illustrated. HR (6)

Notes on the Action of Slags on Refractories, and Some Methods of Testing. A. E. DODD. *Trans. Ceram. Soc.*, Vol. 36, 1937, pp. 63-73. An example of the use of equilibrium diagrams in predicting the extent of slag attack and the limitations of the method are given in detail. The effects of certain physical properties of refractories on their slag resistance are also dealt with, and criticisms are offered of certain laboratory methods of evaluating slag attack. GTM (6)

Important Advantages Derived from Improved Soaking Pits. A. L. HOLLINGER (Surface Combustion Corp.). *Steel*, Vol. 100, Mar. 22, 1937, pp. 41-42. Recently installed 1-way fired soaking-pits are provided with automatic combustion and temperature control and equipped with covers having sand seals and so arranged that cover rises before it moves horizontally. Assures consistent delivery of ingots of the right temperature and surface condition. Recuperators are provided. MS (6)

Experiences with High-frequency Furnaces (Erfahrungen mit Hochfrequenzöfen) N. BROGLIO. *Giesserei*, Vol. 24, Feb. 12, 1937, pp. 73-80. The special advantages of high-frequency furnaces, generation of heat in the material itself and the almost complete transformation of electrical energy into heat in the material without loss (except radiation) are explained. Modern design of furnace, electric generator, control equipment are described. Largest so far built will melt 8 tons. Consumption per ton of melting material is 550-600 kw. The thermal efficiency, including the frequency transformer, is between 60 and 75%. Ha (6)

Propane and Butane Have Specific Value in Production of Luminous Flames. W. Z. FRIEND & E. Q. BECKWITH (Phillips Petroleum Co.). *Ind. Heating*, Vol. 4, Mar. 1937, pp. 187-191; Apr. 1937, pp. 285-287. The advantages of propane and butane as fuel in industrial furnaces are mainly their high heating value of 2550 and 3200 B.t.u. resp., their high C content and low dissociation temperature (about 940° F.), and the luminous flame. The advantages of the latter are explained and compared with other fuel gases. 15 references. Ha (6)

The Significance of Heat Penetration for the Construction and Operation of Pusher Type Furnaces (Die Bedeutung der Durchwärmung für Bau und Betrieb von Stossöfen) F. WESEMANN. *Stahl u. Eisen*, Vol. 57, Mar. 11, 1937, pp. 261-269; Mar. 18, pp. 296-300. Comprehensive discussion. Favorable heating is obtained when heat is applied to the work from the bottom; toward the end the heat input should be lowered. Bottom heating results in smaller temperature gradients, particularly at lower temperatures. SE (6)

Controlled Heat Treating at Buick. J. B. NEALEY. *Heat Treating Forging*, Vol. 23, May 1937, pp. 249-251. Describes procedure and equipment used at the Flint, Mich., plant of the Buick Motor Co. for the heat treatment of automobile-engine parts, with chief attention to the gas-fired furnaces. MS (6)

Mass Production Hardening at Chevrolet. J. B. NEALEY. *Heat Treating Forging*, Vol. 23, June 1937, pp. 295-297. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 142L/2. MS (6)

The Development of Modern Metal Melting Furnaces (Die Entwicklung neuzeitlicher Metallschmelzöfen) J. TROSTMANN & F. WALTER (Siemens & Halske A.G.). *Siemens-Z.*, Vol. 17, Jan. 1937, pp. 18-28. A comprehensive descriptive survey of construction and properties of the different types of melting furnaces, especially of the advantages of induction furnaces, and of the materials produced therein. Low-frequency induction furnaces are now used for melting Cu, Cu alloys and Zn, lately also light metals. Furnace lining is discussed in detail; for melting of brass a mixture is recommended of SiO_2 56.85%, Al_2O_3 31.47%, Fe_2O_3 3.59%, sulphur oxides 2.87%, lime 0.9%, traces of magnesia and other volatile materials 3.40%. Ha (6)

Improved and Notable Furnace Designs (Verbesserte und bemerkenswerte Konstruktionen des Ofenbaues) W. VANDERSEE. *Tech. Zentralbl. prakt. Metallbearbeit.*, Vol. 47, Feb. 1937, pp. 141-145. Descriptive. Modern furnace designers aim at better temperature control and more uniform temperature distribution. Some recent designs exhibited at the Leipzig Spring Fair are fully discussed. Salt baths of 1000-1350° C. operating temperature, nitriding and carburizing furnaces, annealing furnaces with air circulation, etc, are discussed and illustrated. Most of the furnace types are built for smaller shops. EF (6)

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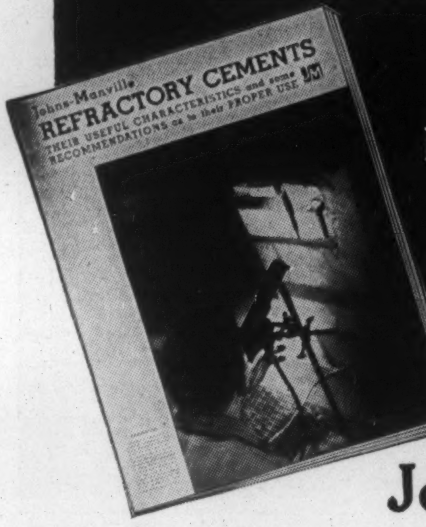
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Calcining Petroleum Coke. J. C. WATKINS. *Chem. & Met. Eng.*, Vol. 44, Mar. 1937, p. 153. How the plant of the Great Lakes Coal & Coke Co. converts petroleum coke to pure carbon in a form suitable to many industrial uses is described in general terms. Petroleum coke is calcined at 2700° F., cooled and placed in dry storage. Typical analysis runs: ash .35%; volatile .39%; fixed carbon 99.26%; soluble salts .11%; S .64%; Si .09%; Fe .06%; density 2.08. PRK (6)

Look out for Secondary Combustion! W. TRINKS (Carnegie Inst. Tech.). *Ind. Heating,* Vol. 4, Apr. 1937, pp. 279-280, 334. Practical. Combustion in the combustion chamber of furnaces is not complete and occasionally in checker work or narrow passages where combustion products are more thoroughly mixed with the unburnt gases and air, secondary combustion may set in; this may overheat or burn the material to be heated. Examples illustrate such conditions. Ha (6)

Refractory Concretes for Coke Ovens and Furnaces. W. M. MCGRUE. *Blast Furnace Steel Plant,* Vol. 25, June 1937, pp. 624-627. Discusses use of refractory concrete for door linings, foundation pads, and other parts of coke-ovens. MS (6)

A Review of Developments in Combustion Control Equipment. M. H. MAWHINNEY. *Ind. Heating,* Vol. 4, Jan. 1937, pp. 35-36; Feb. 1937, pp. 93-98; Mar. 1937, pp. 199-204, 208; Apr. 1937, pp. 273-276, 282; May 1937, pp. 370-374, 384; June 1937, pp. 443-446. Comprehensive review explaining principles, methods and equipment for combustion with different fuels and control of fuel consumption and furnace atmospheres. Ha (6)

Ford Slab Furnaces. J. B. NEALEY (Amer. Gas Assoc.) *Blast Furnace Steel Plant,* Vol. 25, June 1937, pp. 652, 654. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 89L/7. MS (6)

Gas and Oil Fired Melting Furnaces in Light Metal Foundries (Gas- und ölgefeuerte Schmelzöfen in Leichtmetallgiessereien) ERNST FRANKEN. *Leichtmetall,* Jan. 1937, pp. 1-6. Descriptive review. FPP (6)

Steel Making. *Electrical Rev.,* Vol. 120, Apr. 16, 1937, p. 578-580. Describes electric steel melting-furnaces and auxiliary equipment at several British steel-works, with high-frequency furnaces receiving chief consideration. MS (6)

A Recent Installation of Vertical Forced Air Circulation Furnaces. *Wild-Barfield Heat-Treatment J.,* Vol. 2, June 1937, pp. 67-70. Descriptive of two electric furnaces for annealing brass between drawing operations. Gives details of layout, description of furnaces, annealing cycle, recording instruments, and handling equipment. FPP (6)

Electric Foundry Furnaces in America. *Engineer,* Vol. 163, Jan. 22, 1937, p. 110. Use of an electric furnace has been found to be both practical and economical by a foundry doing a small amount of melting. LFM (6)

Gas-heated Tempering Furnace. *Engineering,* Vol. 143, Mar. 19, 1937, pp. 332-333. Descriptive. Furnace made by Messrs. Brayshaw Furnaces and Tools, Limited, of Manchester, England, is intended for secondary hardening of high-speed steels, tempering of C and alloy steels, duralumin treatment and other processes requiring temperatures from 200° C. to 650° C. LFM (6)

Review Progress in Gas Radiant Tube Furnaces and Atmosphere Control. *Steel,* June 14, 1937, pp. 71-72. Report of meeting sponsored by Industrial Gas Section, Am. Gas Assoc. and Midwest Industrial Gas Sales Council. Includes abstracts of **Application of Gas Radiant Tubes to an Enameling Furnace,** by GEORGE M. PARKER; **Application of Gas Radiant Tubes to Batch Type Enameling Furnaces,** by F. S. MARKERT; **Application of Gas Radiant Tubes to Galvanizing Furnaces,** by A. M. THURSTON; **Application of Gas Radiant Tubes to Short Cycle Malleable Annealing Furnaces,** by C. H. MARTIN; **Application of Controlled Atmospheres to the Annealing of Copper and Copper Alloys,"** by W. A. DARRAH; and **Equipment for Generating Controlled Atmospheres Used in Annealing and Hardening Furnaces,** by WILLIAM O. OWEN. MS (6)

Acetylene Flame Now Widely Used in Preparing Bearings for Rebabbitting. *Steel,* Vol. 100, June 21, 1937, p. 65. MS (6)

Heating for Forging by Induction. W. C. KERNAHAN (Staff) *Heat Treating Forging,* Vol. 23, May 1937, pp. 219-220. Describes high-frequency induction heating equipment developed by Ajax Electrothermic Corp. for heating prior to forging or swaging. MS (6)

Continuous Enameling Furnace Heated by Radiant Tube Element. H. M. HEYN (Surface Combustion Corp.) *Ind. Gas,* Vol. 15, June 1937, pp. 9-10. Full description. Ha (6)

Electric Heat in the Manufacture of Light Metals (Elektrowärme bei der Leichtmetallverarbeitung) H. KUNZE. *Leichtmetall,* Dec. 1936, pp. 8-16. Illustrated description of various melting, annealing, hardening and preheating furnaces. FPP (6)

Electric Furnace Development. DONALD F. CAMPBELL (Elect. Furnace Co.) *Electrical Rev.,* Vol. 120, Apr. 16, 1937, pp. 577-578. Discusses electric furnaces and auxiliary equipment for melting and heat treating of steel, with chief attention to the former. MS (6)

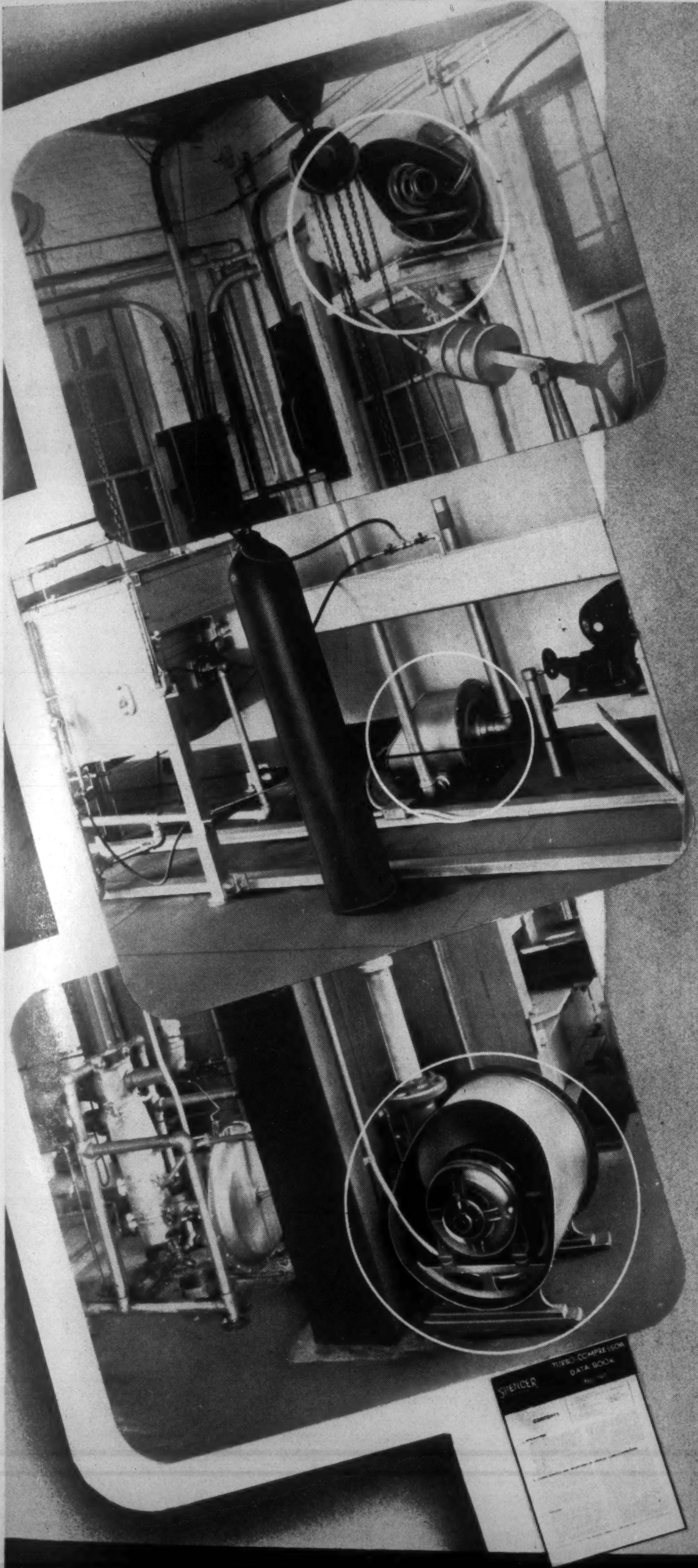
Heat Treating Furnace Specifications. NORMAN C. BYE (Henry Disston & Sons) *Heat Treating Forging,* Vol. 23, June 1937, pp. 298-300. Deals especially with specification for temperature uniformity. Greater benefits can be obtained by making a closer study of the effect of mass and time and laying less stress on extreme accuracy of temperatures. MS (6)

Theory and Calculation of Gas Generator Processes. H. DOBROKHOTOV & V. KOPITOV. *Teoria i Pract. Met.,* No. 1, 1937, pp. 25-40. In Russian. Reactions and processes taking place in gasification of coal are reviewed in detail. (6)

The Firing of Open-hearth Furnaces in German Steelworks. FRIEDRICK WESEMANN. *Engineering,* Vol. 143, Feb. 12, 1937, pp. 191-194. *Blast Furnace Steel Plant,* Vol. 25, May 1937, pp. 506-510. See *Metals and Alloys,* Vol. 8, May 1937, p. MA 270R/1. LFM + MS (6)

On the Heat Distribution in Reheating Furnaces in Steel Works. SABURO UMINO (Japan Steel Mills Co.) *Tetsu-to-Hagane,* Vol. 23, Mar. 25, 1937, pp. 199-218. In Japanese. Original research. Heat distributions in furnace in wire mill, in hot rolling furnace for tin-plate mill, and in soaking pit of blooming mill were calculated; heat economy in each case is treated. NS (6)

Heat Economy in Rolling Mills. HIROMU TAKAOKA. *Tetsu-to-Hagane,* Vol. 23, Mar. 25, 1937, pp. 219-283. In Japanese. Original research. Heat distributions in a gas generating furnace, in a 35 ton open-hearth furnace, in reheating furnaces, and in annealing furnaces, were calculated. NS (6)



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7. JOINING

7b. Welding & Cutting

E. V. DAVID, SECTION EDITOR

Welding and Annealing the Telescope Parts. Norman L. Mochel (Westinghouse Electric & Mfg. Co.) *Welding J., N. Y.*, Vol. 16, June 1937, pp. 24-27. *Welding Engr.*, Vol. 22, May 1937, pp. 30-34; *Ind. & Welding*, Vol. 10, June 1937, pp. 30-34; *Heat Treating Forging*, Vol. 23, June 1937, pp. 274-278. Description and discussion of arc welding of 200 inch telescope using steel plates, bars, structural shapes and a few steel forgings welded into the members of the assembly. The various members are being fabricated in the Westinghouse shop and will be machined and prepared for erection by bolting. Material used for less than 1½ inch thick sections is made of flange quality steel plate similar to that covered by ASTM specification A-70, plates of greater thickness were Si killed, hot top ingots similar to grade "A" ASTM specification A-150. All parts of the telescope received a double anneal to stress relieve the members after welding. An example of this treatment for one of the members is given as (1) heat to 1160° F. in 12 hours, hold for 6 hrs., cool to 600° F. in 11 hrs. (2) Heat to 1150° F. in 10 hrs., hold for 6½ hrs., cool to 125° F. in 42 hrs. Member remains in furnace between the cycles. A number of photos illustrate fabrication methods, stress relief furnace and give a general ideea of the size of the members. WB + MS (7b)

Residual Stresses. *Welding J., N. Y.*, Vol. 16, June 1937, pp. 5-10. Editorial comment on the subject of stress relief for residual stresses made by 11 authorities in the welding field on both sides of the question "to stress relieve or not to." The comments indicate, in general, that: (1) Residual stresses are present but are minimized by good welding technique and design; stresses are not absent from riveted construction. (2) They are equalized in service to some extent by aging or creeping over a long time or by service vibrations and flexing. (3) The limits of the stresses are unknown, and should be studied quantitatively on larger structures; until this information is at hand it is desirable to stress-relieve to increase safety. WB (7b)

The Fatigue Behaviour of Welded Beeams as Affected by Shrinkage Stresses. *Welding J., N. Y.*, Vol. 16, May 1937, pp. 10-11. Summary and conclusions of a report by G. Bierett. *Ber. Deutsch. Ansschusses für Stahlbau*, Ausg. B., Heft 7. J. Springer, Berlin, 1937, 21 pages. Translated by G. E. Claussen. Compressive stresses due to shrinkage in welding are found to affect fatigue strength favorably in certain cases. Fatigue strength was not decreased to any extent by tensile shrinkage stresses. WB (7b)

Fabrication of Machine Parts by Welding. T. Johnston (Whitehead & Kales Co.) *Welding J., N. Y.*, Vol. 16, June 1937, pp. 30-32. Review of advantages of welded steel in machinery construction and illustration in photos of several machine units so constructed. Rigidity is prime consideration in this field with the advantages on the side of steel as against cast Fe. A series of hints on joining parts, reenforcing and normalizing the machinery structures are given and illustrated by sketches. WB (7b)

Safety in Welding. R. B. Lincoln (Ptitsburgh Testing Lab.) *Welding J., N. Y.*, Vol. 16, May 1937, pp. 6-10. Review of code requirements as to welding procedures and welder qualification. The author's interpretation of new qualification rules is that only those tests applying to the job at hand need be made, thus allowing experts to qualify in one special field even though they could not pass test in some other class of work. WB (7b)

Why Welding Procedure Control? C. Louis (Champion Rivet Co.) *Welding J., N. Y.*, Vol. 16, June 1937, pp. 28-30. Discussion of the heat effect in the transition zone next to the last bead of a multiple weld. Illustration of structure of transition zone, weld and parent metal is given in micros. WB (7b)

Welding Symbols and Instructions for their Use. *Welding J., N. Y.*, Vol. 16, June 1937, p. 48, 11 pp. *Ind. & Welding*, Vol. 10, June 1937, pp. 17-18. The new symbols are published by the American Welding Society and supersede the Society's former symbols of 1929 revised in Feb. 1935. WB (7b)

Welding and Casting Not Welding vs. Casting. H. J. Shiffli (American Steel Foundries) *Welding J., N. Y.*, Vol. 16, June 1937, pp. 20-22; *Welding Engr.*, Vol. 22, May 1937, pp. 19-21. Complementary uses for both products are cited. Production economy is main factor in choice of parts of the completed structure to be supplied as casting or weldment. WB (7b)

Thermit Repair again Restores Cable Car Service in Rapid Time. Merritt L. Smith (Metal & Thermit Co.) *Welding J., N. Y.*, Vol. 16, June 1937, p. 30; *Ind. & Welding*, Vol. 10, June 1937, pp. 58-59. Previously welded 12 in. diam. steel shaft failed outside of weld and was Thermit welded without dismantling and put into service the next day. Installation of new shaft would have required a 4 day shut down. Photo of weld shown. WB (7b)

Welding Special Ferrous Alloy Castings—A Review of the Literature to November 1, 1936. W. Spraragen & G. E. Claussen (Welding Res. Comm.) *Welding J., N. Y.*, Vol. 16, June 1937, Supplement pp. 5-9. Brief, concise review of cutting and welding of 14% Mn steel, Cr-Ni and high Si compositions. References also given for other miscellaneous castings. 53 references. WB (7b)

Welding Malleable Cast Iron—A Review of the Literature to December 1, 1936. W. Spraragen & G. E. Claussen (Welding Res. Comm.) *Welding J., N. Y.*, Vol. 16, June 1937, Supplement pp. 10-14. Brief review of important information to enable the reader to determine successful procedure and history in literature. Properties of welded black and white cast Fe are tabulated. 32 references in bibliography. WB (7b)

Inspection of Welded Pressure Vessels. E. R. Fish (Hartford Steam Boiler Insp. & Ins. Co.) *Welding J., N. Y.*, Vol. 16, May 1937, pp. 4-5. General discussion of aims and procedures in inspection of welded pressure vessels and piping. There are two distinct divisions: shop inspection of new work and field inspection of vessels in use. Procedures in welding and inspection according to A.S.M.E. codes and A.W.S. rules are recommended. Radiography is considered a great help, while trepanning of holes through welded joints for etching test of weld soundness is now prohibited by A.S.M.E. code, although Canadian Rules will soon allow this inspection method to be used. WB (7b)

Welding High-tensile Boiler Steels. H. Aysslinger. *Welding J., N. Y.*, Vol. 16, June 1937, Supplement pp. 15-16. Extended abstract, prepared by G. E. Claussen, of an article in die Wärme, Vol. 60, Apr. 3, 1937. WB (7b)

Past and Future of Welding in the Pittsburgh District. G. O. Carter (Linde Air Products Co.) *Welding J., N. Y.*, Vol. 16, May 1937, pp. 11-15. History of the introduction of welding and cutting torch to the steel industry before the war. WB (7b)

The Application of Welding to Large Steel Tanks. Harry C. Boardman (Chicago Bridge & Iron Co.) *Welding J., N. Y.*, Vol. 16, June 1037, pp. 16-19. *Welding Engr.*, Vol. 22, May 1937, pp. 22-26. General review of welder qualification tests and details of tank joints is given with charts. Joint design basis of 95% for joint efficiency according to A.S.M.E. code is cited for butt welded vessel of ASTM-A70 firebox steel which is both radiographed and stress relieved. WB (7b)

What Happens in the Welding Arc. S. C. Osborne (Wilson Welder & Metals Co.) *Welding J., N. Y.*, Vol. 16, June 1937, pp. 11-15. General discussion in which the various factors making for maintenance of metallic arc are given with help of curves and oscillograms. Functions of the coating on the electrode are listed. WB (7b)

Can now Buy Houses, Ready Built Right at the Factory. A. F. Davis (J. F. Lincoln Arc Welding Foundation) *Welding J., N. Y.*, Vol. 16, June 1937, p. 23. Steel house, fabricated by welding in shop moved to site after construction. WB (7b)

All Welded Hopper Cars. Karl T. Nystrom. *Welding Engr.*, Vol. 22, June 1937, pp. 26-30. Manufacturing details and description. Cu-bearing steel plate plus castings used. Only single pass welds used for 320 ft. of welding per car. Welders are not qualified, but build up skill in welding one particular set up. WB (7b)

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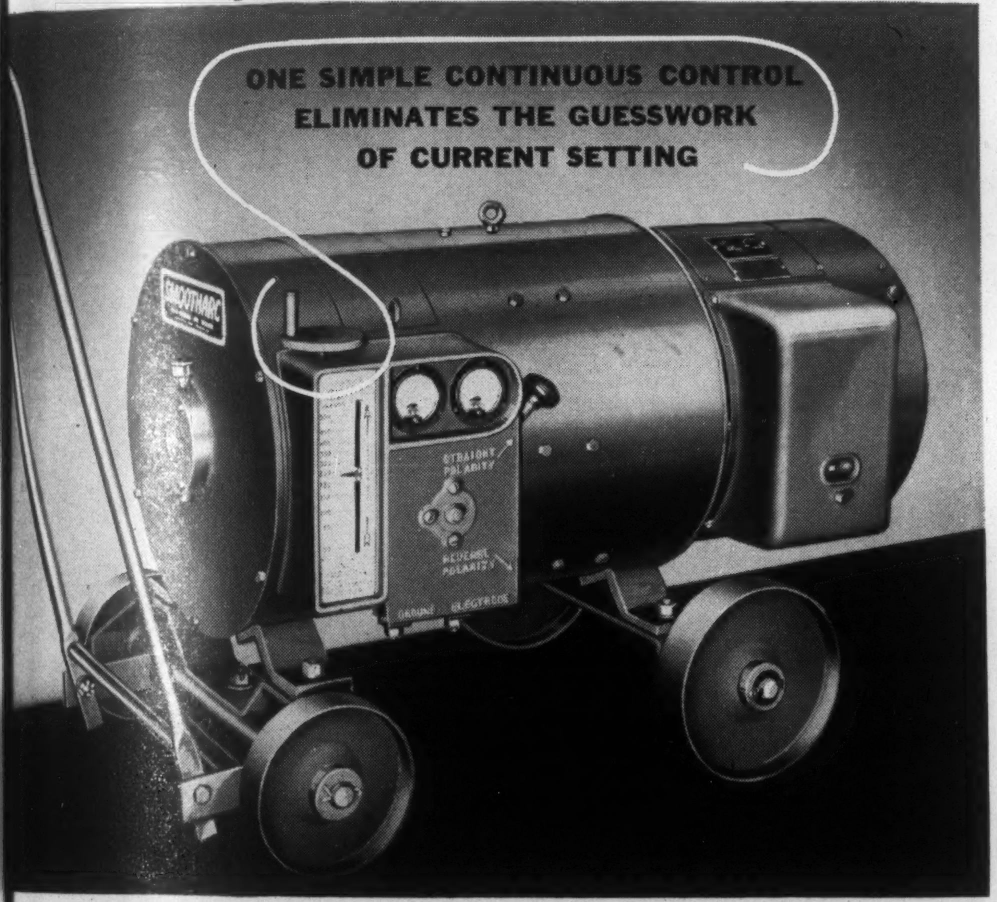
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Welded Steel in Heavy Machinery. HAROLD VERSON (All Steel Press Co.) *Welding J., N. Y.,* Vol. 16, Mar. 1937, pp. 2-4. Review. WB (7b)

Production Welding of Light-gage Tubing. JOHN DOUGLAS (Servel, Inc.) *Welding Engr.,* Vol. 22, Feb. 1937, pp. 28-31. Descriptive. Operations on welding of refrigerator units are discussed as to reliability of welds (torch welds) under pressure test of 900 lb. air. Experience is that one fails out of 15,000 welds tested. Young men are trained in school and shop and first put on tack welding job then go to simple welds. Welders get hourly report of pressure tests on their welds, which are made at rate of 50-90 welds per hr. Supervision is constant and if required welders get shift in production line or reschooling. Details of weld procedure and leak testing are discussed. Max. welding efficiency obtained by having each welder make only one kind of weld in production line. WB (7b)

Groove Rail Welding with the Carbon Arc. W. P. DAVIS (Baltimore Transit Co.) *Ind. & Welding,* Vol. 10, Mar. 1937, pp. 15-16. Brief details of procedure. Symmetric welding on both sides of rail was found to lead to failure in rail where welds ended, cure of failures found in extending welds on one side farther than on the other. WB (7b)

Working Data on the Cutting of Steel by the Oxygen Jet. N. DANIEL & C. E. DURANT. *Welding Ind., London,* Vol. 5, Feb. 1937, pp. 24-34; discussion, Mar. 1937, pp. 78-80. Thorough detailed account of problems connected with gas cutting of steel, review of effect of C, Mn, Si, Cr, Ni; Cu, Mo, W, Al, P and S on "cutability." Those elements decreasing cutting speed, etc., are C, Si, Cr, Mo, W; high Si or Cr may make the steel "non-cutable." Mn aids the torch considerably in cutting, which is reverse of its affect on machinability. Discussion is given of various fuel gases for cutting and their efficiency. Heating efficiency vs. working temperature combustion in air curves are given for H, methane, acetylene and propane. The last appears to be more efficient than acetylene for temperatures below 3000° F.; H is also successful cutting gas if available as cheap by-product gas. The properties of the torch-cut surface as to hardness, C content, appearance and behavior in subsequent welding are reviewed. A series of photos of cut surfaces cut under various favorable and unfavorable conditions is given and serves to diagnose causes of poor cutting results. A review is given of cutting speeds and gas consumption with various gas mixtures for plates of varying thickness, followed by an analysis of O_2 requirements for the various conditions—all these data in curve form. The effect of nozzle size and distance is discussed and correct sizes and distances for efficient cutting can be determined vs. plate thickness from curves in text. The perfect form of nozzle appears to be one in which pressure reduction to atmospheric takes place before emergence from tip thus allowing entire energy of gas to go into directed velocity of perfectly parallel stream of gas. Brief review of cutting costs is appended. WB (7b)

Welding Manganese Steel. J. M. TRISSAL (Ill. Central R.R.) *Ind. & Welding,* Vol. 10, Feb. 1937, pp. 64-67. Concise, comprehensive survey of Mn steel track repair requirements. Electric welding of 10-14% Mn steel castings, water quenched from 1850° F. is now very satisfactory, giving high physicals when Ni-Mn electrodes are used for welds. Welding with plain 12% Mn electrode is unsatisfactory unless entire casting is reheated and quenched. Coated electrodes are unnecessary when d.c. welding, but necessary in a.c. Defects in frogs on railroad track should be cut out and at least 1/8" cold rolled surface ground off. Torch should not be used for removing small amount of material, but may be used for large cuts using small cutting tip and low O pressure. Arc conditions, welding procedure are discussed showing short arc and puddling as necessary also peening weld while hot. WB (7b)

Low Alloy Steels. V. W. WHITMER (Republic Steel Corp.) *Ind. & Welding,* Vol. 10, Feb. 1937, pp. 62-63, 70. Survey of hardenability, strength and microstructure of Republic Double Strength steel welds. Low hardenability as determined by Rockwell B, high tensile values and lack of embrittlement after welding give the steels (.09 C) a high weldability rating. WB (7b)

Repair Welding of Cast Iron (Gusseisen-Reparaturschweissungen) *Arcos Z.,* Vol. 14, Feb. 1937, pp. 1589-1591. In German. Describes and shows a number of interesting cases of welding in repairing machinery parts. GN (7b)

The Arcos Electrode Stabilend B and its Economic Application (Die Arcos Elektrode Stabilend B und ihre wirtschaftliche Verwendung) *Arcos Z.,* Vol. 14, Feb. 1937, pp. 1569-1574. Paper shows that an expensive electrode of high quality may be at least as economical in service as a cheap one. GN (7b)

Welded Steel in Heavy Machinery. HAROLD VERSON (Allsteel Press Co.) *Welding Engr.,* Vol. 22, Feb. 1937, pp. 22-24. Descriptive article detailing economics of weld construction. Shop facilities for large structures, amount of welding required for light plates or substitution of large plate, temporary strengthening to prevent warp during welding are considerations in determining design. Castings versus welding is discussed and time factor is shown to favor welding in that "in welded construction, it is possible to have the entire member cut, welded, normalized and machined before the pattern (for casting) is made." Quantity favors castings as does their use where design is simplified thereby. Where large amount of fitting, rough machining, etc., are required for welding design the single steel casting is the better solution because of lower cost and greater homogeneity. WB (7b)

Economical Fabrication of Ore-treating Equipment. FRANK CONLY. *Welding Engr.,* Vol. 22, Mar. 1937, pp. 32-33. Descriptive, with photos of equipment. WB (7b)

Welded Stainless Steel Stoker Worms. F. M. BENTALL (Iron Fireman Mfg. Co.). *Ind. & Welding,* Vol. 10, Apr. 1937, p. 30. Only part of worm subjected to heavy wear and oxidation is made of stainless. WB (7b)

Application of Oxy-acetylene Welding to the Re-surfacing of Worm Crossings and Permanent-way Bonding on British Railways. C. G. BAINBRIDGE & R. E. DORE. *Engineering,* Vol. 141, June 19, 1936, p. 675. *Welding Ind., London,* Vol. 4, Aug. 1936, pp. 267-274; Sept. 1936, pp. 307-312. Comprehensive survey. WB + VSP (7b)

London Subway's Noise Problem Solved by Welding. GEOFREY BLACKALL. *Welding Engr.,* Vol. 22, Mar. 1937, p. 33. Rail joint welding solved problem. WB (7b)

Electric Arc Welding. K. F. ANTIA. *Indian & Eastern Engr.,* Vol. 79, July 1936, pp. 58-61. General discussion. APS (7b)

Factors that Determine the Choice of Butt and Fillet Welds. C. H. JENNINGS. *Ind. & Welding,* Vol. 9, Nov. 1936, pp. 31-35. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 217L/9. WB (7b)

Some Applications of Welded High Tensile Steel. E. HOLDER. *Welding Ind., London,* Vol. 5, Apr. 1937, pp. 85-86. General discussion and comparison of English and U. S. specifications of steels and properties. WB (7b)

Report on the Twelfth International Congress for Acetylene, Oxy-acetylene Welding and Allied Industries (Redogjörelse för Tolfte Internationella Kongressen för Acetylen, Gassvetsning och Besläktade Industrigrenar) S. AUG. ESKILSON. *Tek. Tid.,* Vol. 67, Mar. 20, 1937, pp. 28-32. A review of the papers presented at the Congress. BHS (7b)

Experiences with and Possibilities of Arc Welding of Aluminum (Erkenntnisse, Erfahrungen und Anwendungsmöglichkeiten der elektrischen Aluminiumschweissung) FRIEDR. H. FLIESS. *Elektroschweissung,* Vol. 7, Dec. 1936, pp. 233-237. Practical. In order to avoid inclusions of slag it is recommended to reduce the space between the edges of the pieces. Sheets up to a thickness of 10 mm. should be welded by one layer, i.e. by using rods of sufficient area and adequate energy. U-shaped edge is advisable with thicker sheets up to 30 mm. Examples of connections between rolled and cast metal are given. HR (7b)

Aluminum Alloy Welding Fundamentals. *Ind. & Welding,* Vol. 10, Mar. 1937, pp. 32-37, 43. Practical procedure briefly reviewed. WB (7b)

A New Factor in Electric Resistance Welding. *Welding Ind., London,* Vol. 5, Apr. 1937, pp. 83-84. Descriptive of meter for graphically following current cycles in spot welding to reproduce a standard procedure or to locate deviations from a standard determined from previous work. WB (7b)

Welding of Chrome-nickel Steel—ASME Boiler Code Committee Case No. 834. *Welding J., N. Y.,* Vol. 16, Apr. 1937, p. 18. Specifications are stated for Cb or Ti stabilized 17% Cr, 9.5% Ni which now receive approval for welding. WB (7b)

Welding of Stainless Steel (Aus der Praxis des Schweissens von rostfreiem Stahl) *Autogenschweisser,* Vol. 10, Jan. 1937, pp. 7-8. Observations and a few practical hints on welding of 18/8 sheets of more than 1 mm. thickness. EF (7b)

Use of New Flux Recommended in Gas Welding of Aluminum Bronze. A. BOUTTÉ. *Automotive Ind.,* Vol. 76, Apr. 17, 1937, p. 593. CMH (7b)

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Safety in Handling Fluids. A Selected Bibliography. *Chem. & Met. Eng.*, Vol. 44, May 1937, pp. 248-249. A list of publications of various trade associations and regulatory bodies which contain much material on safety is given. Bulletins including welded products are mentioned. PRK (7b)

Savings with Design for Welding. *Ind. & Welding*, Vol. 10, Apr. 1937, pp. 39-42. Redesigns of structures for welding to replace former casting design are detailed for a variety of such structures. WB (7b)

Approved Boiler Repair. *Ind. & Welding*, Vol. 10, Apr. 1937, pp. 22-24. Practical details of how defective portions are cut out and boiler patched by welding-in of plate section. WB (7b)

Cromansil Steel Welding. *Ind. & Welding*, Vol. 10, Apr. 1937, pp. 31-35, 38. Compositions for various uses. Oxy-acetylene and arc welding data for 1/16"-3/4" and over thickness and other pertinent discussion as to welding requirements are presented. WB (7b)

Oxy-acetylene Hard-facing Opportunities. *Ind. & Welding*, Vol. 10, Mar. 1937, pp. 46-50. General survey with specific examples of application of hard facing in brick, cement, coke and gas, Fe and steel, lumber and paper, mining, oil and gas, power installation, excavation and road building industries. WB (7b)

Making the New "Bottled Gas" Tanks. E. H. Gill (Columbian Steel Tank Co.). *Ind. & Welding*, Vol. 10, Mar. 1937, pp. 44-45. Descriptive. WB (7b)

The Nickel-copper High-strength Steels for Welded Construction. Alfred E. Gibson. *Welding J., N. Y.*, Vol. 16, Feb. 1937. Supplement pp. 2-6. See *Metals and Alloys*, Vol. 8, June 1937, p. MA 366R/9. WB (7b)

Consider the Lowly Sugar Beet. H. H. Feldstein. *Fab. Progress*, Mar. 1937, pp. 44-47. Descriptive material on manufacture of beet sugar showing use of welding for major part of the operating plant. WB (7b)

Welded Construction for First All-steel Oyster Dredge. T. E. Depew. *Welding Eng.*, Vol. 22, Mar. 1937, pp. 22-23. Design of boat discussed. WB (7b)

Completely Welded Rotating Drum Apparatus (Vollständig geschweisster Drehtrommel-Apparat) W. Lange. *Arcos*, Vol. 14, Apr. 1937, pp. 1612-1614. Detailed illustrated description of the welding of a large drumlike apparatus for filtering naphtha. Such a drum has a length of 13 ft. and a diameter of 7 ft. GN (7b)

The Development of Arc Welding in Steel Construction (Die Entwicklung der Lichtbogenschweissung im Stahlbau) Hans Kopka. *Arcos*, Vol. 14, Feb. 1937, pp. 1574-1579. Resumé of the development in this field showing that the confidence in this type of steel construction is fully justified. GN (7b)

The Metallic Arc Welding of Chrome Bearing Alloys. *Ind. & Welding*, Vol. 10, Mar. 1937, pp. 34-35, 38. Review. Preheating to 300°-500° F. before and during welding is urged to prevent quench hardening. 18-8 electrodes or 4-6% Cr may be used with reverse polarity. Full anneal and furnace cool after welding is recommended. Details for Cr-Mn-Si, Cr-Cu, Cr-V, Cr-Mo, 12-14 Cr, 16-18 Cr, 18-8, 25-12 are included briefly. WB (7b)

Welded Pipe Work and Specials—Activities at the British and Clyde Works of Stewarts and Lloyds, Inc. *Welding Ind., London*, Vol. 5, Feb. 1937, pp. 3-7, 11. Detailed, comprehensive discussion of use of welding in production of large pipe and fittings, low and high pressure. Joints are made by welding and flanges welded on. Fabrication by welding of tubular shore for keeping ships upright in drydock replaces former wooden shore; the new shore telescopes and is therefore adjustable. The discussion is well illustrated with photos of the welded equipment. WB (7b)

New Italian Welding Regulations. *Welding Ind., London*, Vol. 5, Feb. 1937, p. 2. Translation of Italian code, rules and regulations. Divided into six sections, comprising 62 clauses and cover (1) welding systems, (2) classification and method of making welds. (3) characteristics of base metal and welding rod, (4) mechanical tests, (5) allowable stresses, (6) workmanship and inspection. Welders are to carry a book in which results of periodic tests are reported, tests are made by employer at official welding school. No welding is to be done by anyone without a book or whose book shows low proficiency. WB (7b)

Metallurgical Problems of Welding in the Automobile Industry. Armand Di Giulio (Ford Motor Co.) *Welding Eng.*, Vol. 22, Mar. 1937, pp. 25-29. *Welding J., N. Y.*, Vol. 16, Mar. 1937, pp. 8-14; *Iron Age*, Vol. 139, Apr. 1, 1937, pp. 38-42. Review of thermal cycle of welding process and metallurgical changes on heating and quenching from welding heat. Discussion of welding applications indicates use of bare rod automatic arc welds for joining drive shaft tube to splines. Gas welding applications are few in 1937 Ford; pressure-resistance welding is most widely applied. Problems in resistance welding are reviewed. Micros are shown of arc and resistance welds at transition zones and fusion line. WB (7b)

The Welding of Man-ten. *Ind. & Welding*, Vol. 10, Apr. 1937, pp. 37-38. With Mn of 1.25-1.75% this steel is air hardening and requires preheat of 300°-500° F. for welding large mass sections or for flame cutting. WB (7b)

Oxy-acetylene Cutting Prior to Arc Welding in Shipbuilding and Shiprepairing. *Welder*, Vol. 8, July 1936, pp. 997-1000, 1002. Review of conditions and procedure for successful cutting. Microphotographs and tensile test results indicate superiority of flame-cut over machine-cut sections. WB (7b)

Arc Welding in the Construction of Locomotives, Carriages and Wagons for the London Midland and Scottish Railway. *Welder*, Vol. 9, Jan. 1937, pp. 12-21. Descriptive. Saving in weight by replacement of castings is chief reason for welding but careful investigation of comparative costs is made before standardizing on welding. A school for welders is maintained at the plant at which students having some practical experience in welding are put through a course of vertical, horizontal and fillet welding. Details of welding procedure are discussed for fabrication of locomotive frame and others members. Several types of jigs for welding large structures are shown in photos. WB (7b)

Upward Oxy-acetylene Welding Method Increases Output and Cuts Costs. *Steel*, Vol. 100, Mar. 1, 1937, p. 52. Practical. Thin steel sheets and plates to be welded are cut with straight square edges and set so that open space is ½ plate thickness. Welds are made vertically, sheets being stood up and welded from bottom. Hole is first fused through seam at starting point. Incandescent cone is held in front of hole at angle of 30° below horizontal and fusion of surrounding metal started. Welding rod is added. On plates thicker than ¼ in., 2 torches should be used. MS (7b)

Wearing Surfaces Have Longer Life When Lined with New Metal. *Steel*, Vol. 100, Mar. 1, 1937, p. 74. Development of Wilcox-Rich Division, Eaton Mfg. Co., designated "Xaloy." Has tensile strength of 43,100 lbs./in.^{2}; compressive strength of 240,000 lbs./in.^{2}; coefficient of thermal expansion of 7.2 X 10^{-6}/in./1° F., thermal conductivity of 7.5 B.t.u./hr./ft.^{2}/F., and hardness of 750 Brinell. It is applied to annular surfaces by centrifugal casting. It may be run into flat surfaces by welding. MS (7b)

Application of Electric Arc Welding in Apparatus Construction (Anwendung der elektrischen Lichtbogenschweissung im Apparatebau) Felix Münker. *Arcos Z.*, Vol. 14, Feb. 1937, pp. 1579-1583. Describes 2 cases of application of arc welding in apparatus construction. GN (7b)

The Metallurgy of Autogenous Welding (Bedeutung der Metallkunde für die Autogenschweissung) M. Niessner. *Autogenschweisser.*, Vol. 10, Feb. 1937, pp. 16-20. Paper before 33rd General Meeting of the *Austrian Acetylene Assoc.*, critically discusses the metallurgical aspects (melting, solidification, finishing treatments) involved in gas welding. The melting points of metals and their oxides are tabulated, but only a few of the latter are discussed as to their role in welding. Structure of solidified metals and grain refinement of Al welds by addition of Ti are dealt with. Thermal plus/or mechanical treatment of welds is only touched upon. EF (7b)

All-welded Automobile Freight Cars. Karl T. Nystrom. *Welding Eng.*, Vol. 22, Apr. 1937, pp. 24-28. Description. WB (7b)

Large Multi-operator Welding-plants for Shipyards. T. E. Berry Nixon. *Welding Ind., London*, Vol. 5, Mar. 1937, pp. 47-49. Installation of large unit described. WB (7b)

The Selection of Alloy Material in Welded Design. Bela Ronay (U. S. Naval Exp. Sta.) *Ind. & Welding*, Vol. 10, Mar. 1937, pp. 39-42. Review of some problems encountered in welding: composition and properties of deposit, microstructure, damage to parent metal in heat affected zones. WB (7b)

Penetration. Bela Ronay (U. S. Naval Exp. Sta.) *Welding Eng.*, Vol. 22, Mar. 1937, pp. 30-31. Critical, informative discussion in which accepted definition of penetration is shown to be related to the mass of base metal melted and not merely to the depth to which the base is melted. Maximum power input electrode has highest penetration ratio (50%). Factors in penetration are electrode coating, C content of electrode, polarity and welding methods. A practical comparative test of electrode qualification, as to penetration, is suggested as single bead fillet which is polished, etched and examined. WB (7b)

Recent Improvements in Automatic and Semi-automatic Machines for Arc Welding. R. Sarazin. *Welding Ind., London*, Vol. 5, Mar. 1937, pp. 53-58. Review of problems and discussion of French practice. Time ratios for a given job are 1-1.5 to 2—4 to 5 for manual, semi-automatic and automatic, respectively. C arc is considered more rapid and economical for repetition work. A number of photos illustrate the various welding machines and methods of welding. Properties obtained in automatic welding pass acceptance tests of French and British bureaus. Very high production speeds are claimed. WB (7b).

Arc Welding of Transportation Equipment (Die Lichtbogenschweissung im Transportanlagenbau) Jos. Sauer. *Arcos Z.*, Vol. 14, Feb. 1937, pp. 1583-1586. Illustrated description of numerous parts made by arc welding. GN (7b)

The Weldability of Binary Aluminum Bronzes (Zur Kenntnis der Schweissbarkeit binärer Aluminiumbronzen) H. Scepanik. *Elektroschweissung*, Vol. 8, Feb. 1937, pp. 28-32. Practical. The difficulties of welding these bronzes arise from the formation of thick oxide films. HR (7b)

The Application of Rolled or Welded Sections (Ein Beitrag zur Frage der Verwendung von Walz- oder Schweissprofilen) Otto Schellschmidt. *Arcos Z.*, Vol. 14, Apr. 1937, pp. 1609-1611. Paper describes in detail economic application of arc welding in constructing a large garage 14 m. wide. 26% in weight was saved in comparison with a similar riveted construction. GN (7b)

Application of Arc Welding in Fabricating Road-building Machinery (Anwendung der Bogenschweissung bei der Herstellung von Baumaschinen) W. Seydewitz. *Arcos. Z.*, Vol. 14, Apr. 1937, pp. 1618-1621. Descriptive. GN (7b)

Electric Welding in Cruiser Construction. C. E. Sherwin. *Welding Ind., London*, Vol. 4, May 1936, pp. 129-134; July 1936, p. 229-234. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 90L/2. WB (7b)

A Device to Aid Welding of Long Monel Sheets. W. F. Sitler (Intern. Nickel Co., Inc.) *Welding J., N. Y.*, Vol. 16, Apr. 1937, p. 6. Practical device for constant taper and preventing overlapping ahead of weld in butt weld joints. WB (7b)

Milling Machine Shape Cutter. Harold E. Smith. *Welding Eng.*, Vol. 22, Apr. 1937, pp. 22-24. Details of the assembly of cutting torch, templates and cutting table are given. A separate motor is used to drive the material to be cut under the flame; contours and straight cut can be made. WB (7b)

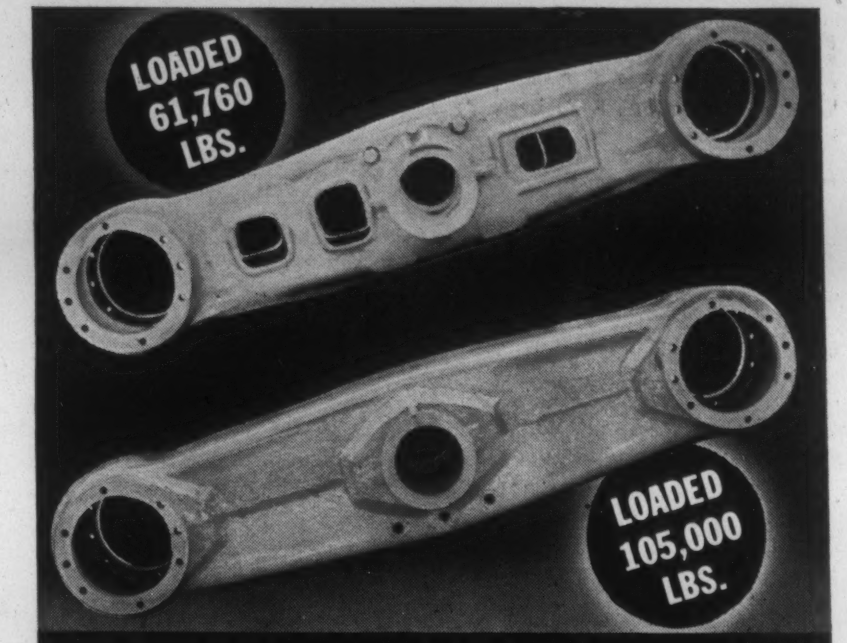
Steel Hard-facing Procedure. E. E. LeVan (Haynes Stellite Co.) *Welding J., N. Y.*, Vol. 16, Apr. 1937, pp. 32-36. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 156R/6. WB (7b)

Welding Procedure. A. Ramsay Moon. *Welding Ind., London*, Vol. 5, Mar. 1937, pp. 68-78. Comprehensive review of data on physical properties as affected by electrode size, current, plate size, electrode composition, melting rate. Welding procedure and economy is reviewed on basis of electrode size and energy put into the weld. Weld, design, avoidance of distortion and shrinkage stresses are discussed. WB (7b)

Modern Methods of Welding in the Automobile and Railway Industries. J. W. Meadowcroft (E. I. Budd Mfg. Co.) *Welding J., London*, Vol. 33, Sept.-Oct. 1936, pp. 270-272. See *Metals and Alloys*, Vol. 8, June 1937, p. MA 369L/10. WB (7b)

Welding Jigs and Fixtures. Joseph W. Meadowcroft (E. I. Budd Mfg. Co.) *Welding J., N. Y.*, Vol. 16, Apr. 1937, pp. 11-13. Review. WB (7b)

Fluxes in Welding Electrodes. D. L. Mathias (Metal & Thermit Co.) *Ind. & Welding*, Vol. 10, Feb. 1937, pp. 51-55. **Fluxes—their Function in Metallic Arc Welding.** Ibid. *Welding J., N. Y.*, Vol. 16, Feb. 1937, pp. 20-21. See *Metals and Alloys*, Vol. 8, June 1937, p. MA 366L/10. WB (7b)



AGAIN WELDED STEEL
WINS DESTRUCTION TEST

Supported at both ends and loaded at the center, the cast steel design shown at the top failed at 61,760 lbs. Under the same set-up, the welded steel design shown at the bottom withstood a loading up to 105,000 lbs. The weight and cost of each was practically the same.

This test was made by the Athey Truss Wheel Co., Chicago, to prove the superiority of their new welded rocker beam for "Forged-Trak" wheels. The welded design employs 5/16" pressed steel stampings as the main members. Hubs are cast steel. The part is welded in a positioning jig so that all welding is downhand. Two passes of 1/4" "Fleetweld 7" are used. The total welding time is 3 hours. A new *"Shield-Arc SAE"* welder contributes to the speed and quality of the welding.

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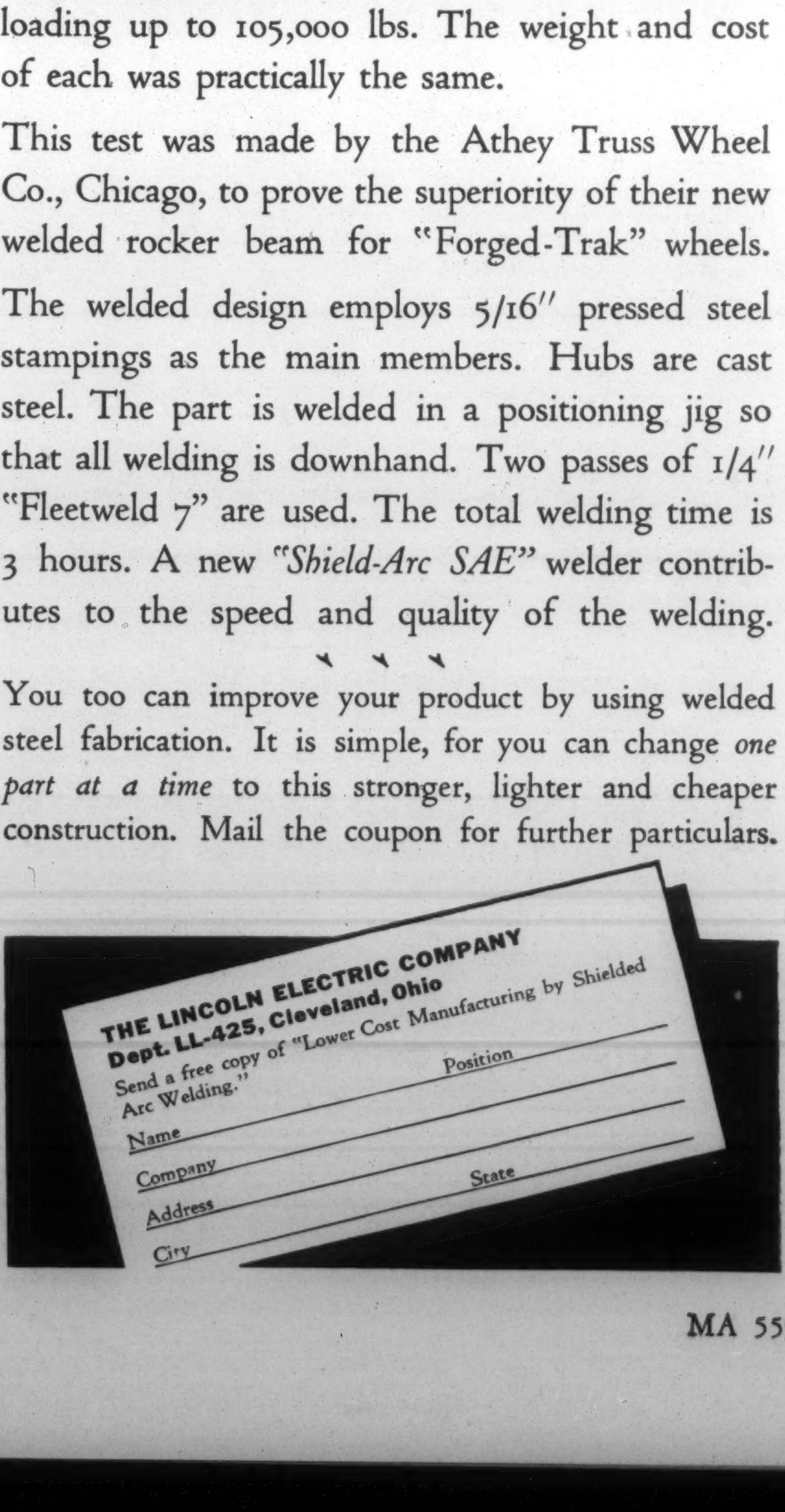
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8. FINISHING

H. S. RAWDON, SECTION EDITOR

Changing Finishing Operations on Vacuum Cleaner Parts. *Iron Age,* Vol. 139, Apr. 22, 1937, pp. 44-47, 97. Practical description. Al-alloy castings are replaced by Mg-alloy castings in the manufacture of vacuum cleaners (Hoover Co.). In addition to changes in foundry other changes were necessary, one of the most important being the installation of metal finishing equipment, since Al castings do not require very extensive treatment. Gives detailed description of the plant equipment used for the Mg-alloy castings. VSP (8)

8a. Pickling

A New Theory of Inhibitor Action and a New Method of Inhibitor Evaluation (Ueber eine neue Sparbeiztheorie und eine neue Methode zur Beurteilung von Sparbeizen) W. MACHU. *Korrosion u. Metallschutz,* Vol. 13, Jan./Feb. 1937, pp. 1-20. Original research. Investigations with 11 different organic inhibitors are described in detail; the tests corroborate previous indications that inhibiting effect is due to an adsorption of the inhibitor on the bare Fe surface so that the action of the pickling acid is restricted to the removal of the scale. In all tests it was found that this adsorbed protective layer has a porosity of about 60%. Any organic substance capable of forming on the Fe a layer with an electric resistance of at least 3 ohms, can serve as an inhibitor. The electric resistance, and thus the protective action of the layer result from the narrowing of the interstices between the molecule chains or the intermicellular spaces, and consequent reduction of the diffusion and migrating velocity. As the electric resistance of the adsorption layer is much higher than that of a passivating layer the former must have a much denser structure than the normal gels. The resistance of the layer is characteristic constant of the material and is independent of constitution, concentration, surface tension, viscosity or dissociation of the pickling agent, and can therefore be used for defining the inhibitor quality. 7 references. **Critical Review of Previous Inhibitor Theories and Explanation of the Action of Organic Inhibitors in the Acid Corroson of Metals (Kritische Betrachtung der früheren Sparbeiztheorien und Erklärung der Wirkungsweise Organischer Inhibitoren bei der Säurekorrosion von Metallen)** *Ibid,* pp. 20-33. The known inhibitor theories are discussed and checked for their correctness. None of them is able to explain all phenomena in the inhibiting effect. The most satisfactory is the adsorption theory of the author (see previous abstract). The defects of the theories are described in detail. 37 references. Ha (8a)

Modern Fume and Acid Sewer Serves Continuous Strip Pickling Unit. J. R. HOOVER (B. F. Goodrich Co.). *Steel,* Vol. 100, Mar. 29, 1937, pp. 71-72. Describes installation at Campbell, O., works of Youngstown Sheet & Tube Co. Constructed of rubber-lined flanged steel pipe. Lower inside half of largest pipe is sheathed with acid-proof brick. Special rubber expansion joints are used. Pipe is mounted on steel rollers. MS (8a)

Pickling Sheet Iron Prior to Porcelain Enameling. J. T. IRWIN. *Enamelist,* Vol. 14, Jan. 1937, pp. 11-14, 60. General review. An electric a.c. pickling bath is described. PCR (8a)

8b. Cleaning including Sand Blasting

Chemistry and Mechanics of Metal Cleaning (Chemie und Mechanik der Metalleutfettung) J. BENOLIEL. *Beizerei* (Supplement to Emailwaren-Ind.) Vol. 1, Aug. 27, 1936, pp. 5-6. Discussion of general principles. See *Metals and Alloys,* Vol. 8, Jan. 1937, p. MA 26R/9. RAW (8b)

8c. Polishing & Grinding

Lapless Gages. H. J. WILLS (Carborundum Co.) *Am. Machinist,* Vol. 81, Mar. 24, 1937, p. 247. A new commercial process of finish-grinding is described by which the gages or pieces to be finished to dimension are built up by Cr-plating and then ground in a single process on a recently developed aloxite resinoid wheel thus eliminating a series of wheels of progressively increasing fineness. Ha (8c)

Grinding of Cemented-carbide Milling Cutters. HANS ERNST & MAX KRONENBERG (Cincinnati Milling Machine Co.) *Mech. Eng.,* Vol. 59, Apr. 1937, pp. 221-226. *Iron Age,* Vol. 139, June 17, 1937, pp. 51-53. Practical. Methods and equipment for grinding and sharpening the tips of cemented-carbide for milling cutters are given. Ha + VSP (8c)

Sharpening Wheels. V. H. ERICSON. *Am. Machinist,* Vol. 80, Dec. 2, 1936, pp. 988-990. Practical. The selection of wheels for grinding a given material is discussed and the abrasive, grain size and bond for various kinds of operations are tabulated. Ha (8c)

8d. Electroplating

The Electrolytic Deposition of Copper on Aluminum After Previous Chemical Oxidation (Die galvanische Abscheidung von Kupfer auf Aluminium nach vorausgegangener chemischer Oxydation). W. HELLING & H. NEUNZIG (Aluminium-Werke A.-G.). *Aluminium,* Vol. 19, May 1937, pp. 302-305. According to a new process Al and its Cu-free alloys can be plated in acid electrolytes with a firmly adhering Cu layer after having been chemically oxidized in soda-sodium-chromate (MBV-process) and soda-sodium-metavanadate solutions without intermediate pickling. The metal is first degreased in cold 10% NaOH for 10 min., neutralized in 2% HCl, dipped 15 min. in hot MBV solution, and then electroplated in a bath of 150 g. $CuSO_4$, 60 g. 65% H_2SO_4, 0.01-0.1 g. gelatine, 1000 g. H_2O, with a current density of 1-1.1 amps./dm.^{2} for 60-90 min. at 20°-25° C. The Cu deposits adhere even at 400° C. under bending at 180°. The density of the deposit on Al-Si alloys is better the more Si is in solid solution in the alloys. 5 references. Ha (8d)

Electrolytic Zinc Methods Applied to Galvanizing. H. C. TAINTON. *Am. Zinc Inst., Preprint,* Apr. 1937. Descriptive of the process of electroplating steel wire as practiced at the Sparrows Point and Johnstown plants of Bethlehem Steel Co.; these plants have a combined daily output of 90 tons of electroplated wire. Zn for plating bath is obtained by leaching roasted concentrate, containing about 69% Zn, in spent electrolyte from the plating cells, containing 25% free H_2SO_4. The leach solution is filtered in pressure filters and purified with Zn dust to remove Cu, Cd, Co, etc. Plating is carried out in Pb-lined cells, with insoluble Pb anodes containing 1% Ag. The Sparrows Point plant has four cells, 55 ft. long, taking 15,000 amps. at 4 volts. Each cell has 8 wires. At the Johnstown plant there are two cells, 110 ft. long, 12 wires and 40,000 amps. each. Contacts for the current are spaced 3 ft. apart along the cells. Current densities ranging from 750 to 2000 amps./ft.,^{2} permit a Zn coating of 1 oz./ft.^{2} to be deposited in a time varying from 45 sec. to 2 min. The purified solution is fed to the cells at a definiite rate, and the wire is drawn through the cells at a speed depending upon the thickness of coating desired. The coated wire is washed in water, drawn through polishing dies to brighten the surface and make it more dense and then coiled. An important step is the initial cleaning of the steel wire. The wire is first annealed to remove grease, passed through acid and then anodically pickled. The deposit has a purity of 99.99% Zn or better. BHS (8d)

Electrogalvanizing Round Wire with Heavy Coatings—A Recent Development. C. C. CRANE (Republic Steel Corp.) *Steel,* Vol. 100, May 10, 1937, pp. 71-72. Industrial note describing continuous electrogalvanizing unit with capacity of 40 strands of wire, installed in plant of Republic Steel Corp., Chicago, Ill. Current densities up to 1500 amps./ft.^{2} are used. Thick coatings of pure Zn are produced. MS (8d)

Nickel Plating Procedure. W. A. KOEHLER. *Metal Cleaning Finishing,* Vol. 8, May 1936, pp. 243-246. Practical review of principles governing the operation of Ni plating solutions. Allowable impurities are listed and method for their removal is given. Ni may be removed from brass by making it the anode in 1:20 HCl solution. For stripping of Ni from steel, concentrated H_2SO_4 should be used or an immersion in concentrated HNO_3. Formulas are given for depositing Ni from the single and double salt solutions. For rapid Ni plating the formula is given as: Single Ni salts 27 oz./gal., Ni chloride 3 oz./gal., Boric acid 4 oz./gal., at 50-60° C., current density 19-47 amp./ft.^{2} 8 references. GBH (8d)

Structure of Electrolytic Deposits (Sur la Structure des Dépôts Électrolytiques) PIERRE JACQUET. *Compt. Rend.*, Vol. 204, Mar. 1, 1937, pp. 670-672. Original research. The structure of the first layer of Cu deposited from a cyanide bath with a current density of 25-50 milliamp./dec.^{2} resembles the crystalline structure of the cathode. At higher current densities (70 milliamp.), the liberation of H_2 influences the structure of the first thin layers of the deposit. In general, deposits of all metals of the Fe group and deposits of all metals from complex salts are influenced by the evolution of H_2. FHC (8d)

Gold Control in Electrogilding. J. B. KUSHNER. *Metal Cleaning Finishing,* Vol. 8, Mar. 1936, p. 117, 5 pp. Practical outline of method for the administration and conservation of the gold used in the electroplating process. Stock record and removal record forms are suggested. Formulas for calculating the weight of gold alloy to be deposited and for estimating the loss with a single recovery rinse tank, are given. GBH (8d)

Hardness of Chromium Plate (La Dureté du Chrome Électrolytique) MICHEL CYMBOLISTE. *Compt. Rend.,* Vol. 204, Apr. 5, 1937, pp. 1069-1071. Original research. For a constant relation of Cr^{VI}/SO_4 concentration, the hardness of electrodeposited Cr decreases with increase of chromic acid concentration. With a concentration of $Cr\,O_3 = 300$ g./l. and of $Cr^{VI}/SO_4 = 50$, the hardness of the Cr plate decreases with increase of current density if the temperature is less than 55°C. The reverse is true above 55° C. FHC (8d)

Preparation of Thin Layers of Ti by Electrolysis (Sur la Préparation de Couches Minces de Titane par Voie Électrolytique) M. HAÏSSINSKY & H. EMMANUEL-ZAVIZZIANO. *Compt. Rend.,* Vol. 204, Mar. 8, 1937, pp. 759-761. Original research. Thin layers of Ti are produced by electrolysis as follows: Pb cathode, Pt anode, current 15-20 milliamps./cm.^{2} and a solution with a pH between 1.2 and 1.6 to which 1.5 g. $Na_2SO_4.10H_2O$ are added. FHC (8d)

Recent Developments in Electroplating. M. DEKAY THOMPSON. *Metal Cleaning Finishing,* Vol. 8, Jan. 1936, pp. 13-16; Feb. 1936, pp. 65-67. Summary of late developments in depositing Cr, Ni, Cd, Zn and Ag. Results of exposure tests are given. Electrodeposited alloys of about 80% Ag and 20% Cu contained streaks or nodules which were attributed to P in the basis metal, from 0.008 to 0.2%, as the compound Cu_3P. Method of eliminating this phenomenon is given. Au, Rh, Cu, W, Sn, and alloy plating are also discussed. Bibliography is attached. GBH (8d)

Laminated Chromium Deposits. R. J. PIERSOL. *Metal Cleaning Finishing,* Vol. 7, Dec. 1935, pp. 587-590. Practical. High internal stress in thick Cr deposits tends to cause peeling. An experience in Cr plating a plug gauge is described. A heavy deposit applied on continuous plating peeled. In a second trial the gage was plated for 5 min. then removed from the solution for 1 min., plated again, etc., for a total plating time of 25 min. The coating produced in this way did not peel. In this way 30 mils of chromium can be deposited per hr. GBH (8d)

Plating Silver to Specification. C. B. F. YOUNG. *Metal Cleaning Finishing,* Vol. 8, May 1936, pp. 227-231. Practical. Factors which must be controlled in order to know how much Ag is deposited are discussed. Various tables are given for different types of work. Results of experiments are recorded and methods of control suggested. 3 references. GBH (8d)

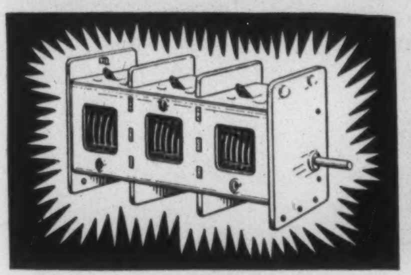
Influence of Working Conditions on the Porosity of Tinplate. W. E. HOARE (Intern. Tin Research & Development Council). *Metallurgist,* Suppl. *Engineer,* Apr. 1936, pp. 115-116. Extended abstract and discussion of a paper by Fritz Peter and Georges Le Gal in Arch. Eisenhüttenw., (*Metals and Alloys,* Vol. 7, July 1936, p. MA 357R/6). VVK (8d)

Bright Zinc Plating. R. O. HULL. *Metal Cleaning Finishing,* Vol. 8, Apr. 1936, pp. 169-173. The relative merits of Cd and Zn are discussed together with their electroplating characteristics. The fundamentals, applications and limitations of bright zinc are gone over. GBH (8d)

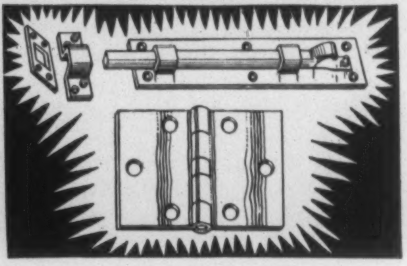
Small Electric Heating Unit Doubles Output of Silver Plating Plant. *Steel,* Vol. 100, Apr. 19, 1937, pp. 66, 69. Northern Ohio Plating Co., Cleveland, O., immerses a heating unit, made of Chromalox strip in a section of 2-in. Pb pipe, in plating bath to keep it up to temperature when shop is not operating and thus prevent precipitation of AgCN. MS (8d)

Advances in Industrial Electroplating. C. F. J. FRANCIS-CARTER. *Chem. Trade J.,* Vol. 99, Sept. 18, 1936, p. 238. *Electrical Rev.,* Vol. 119, Sept. 25, 1936, p. 405. General survey. MS (8d)

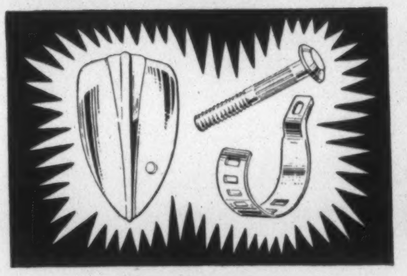
Now
PLATED WITH
DU PONT BRIGHT ZINC



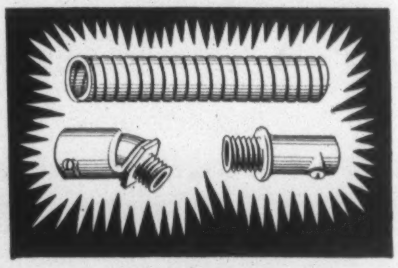
RADIO PARTS



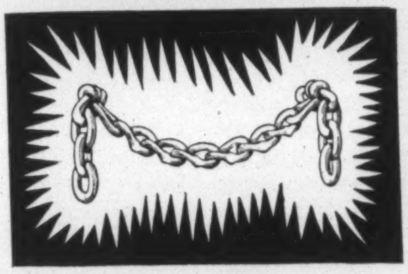
BUILDERS' HARDWARE



AUTOMOTIVE PARTS



CONDUIT FITTINGS



TIRE CHAIN

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Republic's New Wire Mill Includes Electro-Galvanizing Equipment. *Iron Age,* Vol. 139, May 13, 1937, pp. 48-58. Describes the galvanizing plant and equipment of the Republic Steel Corporation, South Chicago, Ill. Includes a composite drawing showing the many uses for overhead materials handling equipment of various types. VSP (8d)

Surface Passivation of Aluminum and its Alloys. II (Oberflächenveredlung von Aluminium und seinem Legierungen. II) *Leichmetall,* Dec. 1936, pp. 16-20. Review of anodic oxidation methods, with complete description of technique, operating conditions and results. FPP (8d)

Electrolytic Surface Treatment of Magnesium as Protection against Corrosion (Der Korrosionschutz von Magnesium durch elektrolytisch beeinflusste Veränderung der Oberfläche) FRITZ MARKHOFF. *Leichmetall,* Jan. 1937, pp. 10-12. Review of patents covering electrolytically produced surface films, particularly those containing fluorides, on Mg and its alloys. FPP (8d)

An Anodic Treatment for the Production of Aluminum Reflectors. N. D. PULLEN. *Metal Cleaning Finishing,* Vol. 8, Nov. 1936, pp. 761-766. Descriptive. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. 95L/9. GBH (8d)

Degreasing Prior to Electrodeposition (La sgrassatura prima dell' elettrodeposizione) V. P. SACCHI. *Ind. Meccan.,* Vol. 19, May 1937, pp. 322-324. General observations on necessity, effects and methods of degreasing before electroplating; substances used are discussed. Ha (8d)

8e. Metallic Coatings other than Electroplating

Rust Protection II. Metallic Coats Firmly Attached to the Base Metal by Fusion (Ueber Rostschute II. Metallische Ueberzüge mit fester verbindung mit dem Grundmetall, hergestellt auf schmelzflüssigem Wege) H. ROTERS. *Mitt. Forsch.-Inst. Probieramts Edelmetalle,* Vol. 10, Mar. 1937, pp. 119-128. Review. As their m.pts. are lower than that of Fe, coats of Zn, Sn, Pb, Cd and Al can be produced by dipping the iron article to be coated into the molten metal. The method and properties of the coats are described. Overheating of the molten bath (particularly Zn) must be avoided to decrease formation of dross and hard zinc (Fe-Zn compound). Additions of Sn, Cd, and Al to Zn increase the brightness, and also improve adhesion. Al in additions from 0.05 to 0.3 or even 3% makes the Zn bath more liquid and promotes the formation of thinner coats. The minimum thickness should be 350 g. Zn per in.^{2} Pb baths are always used with an addition of 3-50% Sn, Sb, Hg and/or Zn; the bath is covered with a protective layer of $ZnCl_2$. Addition of 0.5% Hg improves adhesion and corrosion resistance. Sn requires, to give reliable rust protection, at least 30-35 g./in.^{2}, and for canning foods and vegetables, a suitable lacquer should be applied over the Sn coat. Cast Fe can be tinned but must first be treated by annealing in Fe_3O_4 for 4-6 hrs., or pickling in H_2SO_4, and dipping in $CuSO_4$ solution for slight Cu plating. To obtain good adhesion, 10% Pb can be added to this Sn bath. A Cd coat is made similar to Zn; it can replace Sn coating except where foodstuffs come in contact with the coat. To obtain a good coat of Al the easy oxidation of the latter must be overcome, e.g. by first employing an intermediary Zn layer or one of Sn. Al coats provide good heat resistance. Al baths are used with Mg, Mn or Si additions, but must be free of Cu and Zn which impair corrosion resistance; the bath should be kept at 700°-720° C. An intermetallic compound Al_3Fe is formed. Al coated Fe shows four zones: the unchanged Fe core, an Fe-Al solid solution layer, an Al_3Fe compound zone and an exterior Al zone interspersed with Al_3Fe; the Al_3Fe layer should be kept thin as it is brittle. The strength of the steel is reduced much more by Al than by Zn coats (on account of the higher temperature required in the treatment). Most of these coats can also be produced by spraying; practices are briefly discussed. 10 references. Ha (8e)

New Knowledge of the Properties and Manufacture of Metal-clad Sheet (Neuere Erfahrungen über die Eigenschaften und die Verarbeitungsmöglichkeiten plattierter Bleche) W. RÄDEKER (Deutsche Röhrenwerke A.G.) *Z. Metallkunde,* Vol. 29, Jan. 1937, pp. 1-9. Review and original citations, with discussion (no bibliography); concerned primarily with Fe and steel coated by the metal-clad process for use in chemical industries. Bending and twisting tests, with microscopic examinations, show that the best coating penetrates the grain boundaries and fills the surface flaws of the base metal and forms a diffusion zone without brittle components. For special cases, endurance tests and sudden temperature changes must be withstood. Good properties can be retained by proper welding. GD (8e)

The Adherence of Sprayed-metal Coatings of Zinc, Steel, and V2A (Die Haftfähigkeit gespritzter Metallüberzüge aus Zink, Stahl und V2A) T. EVERTS (Tech. Hochschule Karlsruhe) *Z. Metallkunde,* Vol. 29, Feb. 1937, pp. 63-66. Original investigation. The best surface for sprayed coatings on steel is obtained by blasting with rough quartz powder followed by short etching in HCl. Bend tests of sprayed specimens and tensile tests of soldered specimens are described. Data are given on the most satisfactory gas compositions and pressures and other gun technique for obtaining adherent coatings of Zn, steel, and stainless steel (V2A); the latter should be applied with a neutral flame while the others require reducing conditions. GD (8e)

8f. Non-Metallic Coatings

Coloring of Metals with Molybdate Solution (Metallfärbung mit Molybdatlösung) H. KRAUSE. *Metallwaren- Ind. Galvano-Tech.,* Vol. 35, Jan. 15, 1937, pp. 43-44. Original research. A great number of coloring tests on Al, Fe and Zn die castings were made with the object of improving previously reported solutions (see *Metals and Alloys,* Vol. 6, p. MA 365R7) and of checking upon some recent patent claims. The original must be consulted for the great number of recipes and results. EF (8f)

Rubber Lined Steel Sewer Pipe Handling Acid Waste. H. C. KLEIN (B. F. Goodrich Co.). *Iron Age,* Vol. 139, Apr. 1, 1937, pp. 44-45. Describes acid sewer pipe line of Inland Steel Co. The steel pipe is lined with Triplex rubber and consists of 650 ft. of steel pipe with plain ends. VSP (8f)

Principles, Present State and Future of Surface Improvements of Light Metals and Light Metal Alloys (Grundlagen, Stand und Aufgaben der Oberflächenveredlung von Leichtmetallen und Leichtmetall-Legierungen) HEINRICH CARLSON (Univ. Leipzig). *Metallwaren-Ind. Galvano-Tech.,* Vol. 35, Jan 2, 1937, pp. 16-20. Survey. The protective coatings for Al and Mg alloys are classified and the most important German patents on Mg alloy coatings are cited. EF (8f)

Aluminium Paint; Growing Popularity. J. K. PARKINSON. *Times Trade and Eng.,* Vol. 40, Mar. 1937, pp. 60-61. Deals with development of Al paste, and properties and applications of Al paints. MS (8f)

Chemical Colouration of Tin. D. J. MACNAUGHTON & R. KERR. *Chem. Trade J.,* Vol. 100, Jan. 15, 1937, p. 50. Review. MS (8f)

Steel Containers for Food Products Finished Under Sanitary Conditions. *Steel,* Vol. 100, Mar. 8, 1937, pp. 52-53, 64. Describes practice of Natl. Steel Barrel Co., Cleveland, O., in manufacture of barrels and drums, with chief attention to finishing. Barrels are sprayed with enamel in sealed rooms supplied with filtered air. MS (8f)

Modern Porcelain Enameling Practice in America. I. N. WHITESMITH. *Enamelist,* Vol. 13, Aug. 1936, pp. 28-32, 36. PCR (8f)

Porcelain Enamel Forum Stimulates Interest in Improved Shop Practices. *Steel,* Vol. 100, May 17, 1937, p. 58, 60, 78-79. Report of the forum held by the Porcelain Enamel Inst. at the Univ. Illinois, with abstracts of the papers presented. MS (8f)

Truck Builder Modernizes Finishing Operations. *Iron Age,* Vol. 139, Apr. 1, 1937, pp. 52-54. Brief description of the White Motor Co.'s new installations of conveying and other equipment for coating truck parts. VSP (8f)

Electrolytic Oxidation of Aluminum Alloys and the Four Year Plan (Die Bedeutung der Oberflachenveredung von Aluminium und Aluminium-Legierungen durch elektrolytische Oxydation nach dem Eloxalverfahren im Rahmen des Vierjahresplans) WALTER RISCH. *Metallwaren- Ind. Galvano-Tech.,* Vol. 35, Feb. 15, 1937, pp. 86-89. *Oberflächentech.,* Vol. 14, Mar. 16, 1937, pp. 59-61. Review. Underlying principles of Eloxal (anodic oxidation) method. Hardness, corrosion resistance, adaptability to coloring, electrical and heat resistance, emissivity, welding and soldering, applications of Al alloys treated by the Eloxal process. EF + Ha (8f)

Anodic Process Applies Uniform Rubber Coating to Intricate Metal Parts. *Steel,* Vol. 100, Mar. 22, 1937, p. 57. Metal parts are thoroughly cleaned in an acid solution, subjected to several secret treatments, coated in an electrically charged tank of latex, dried, and cured for 3 days at 150° F. MS (8f)

9. TESTING

Modern Methods for Testing Metals (Les méthodes Modernes d'Essai des Métaux) ROBERT l'HERMITE. *Bull. Soc. Ing. Soudeurs,* Vol. 7, May-Aug. 1936, pp. 2195-2216. Gives on the basis of modern knowledge a general explanation of distortion and breakage of metals and describes theory and use of X-rays. FR (9)

The Microscope as an Aid in Mining and Metallurgy (Das Mikroskop als Hilfsmittel im Berg- und Hüttenwesen) *Montan. Rundschau,* Vol. 29, Apr. 16, 1937, 3 pp. A description of some of the later microscopes used in metallurgical laboratories. BHS (9)

Scientific and Industrial Research. *Engineer,* Vol. 163, Feb. 12, 1937, pp. 190-191; Feb. 19, 1937, pp. 209-210. Summary of the Report of the Dept. Scientific and Industrial Research for the year 1935-36, one section of which deals with the metallurgical research carried out at the Natl. Phy. Lab. LFM (9)

9a. Inspection & Defects, including X-Ray Inspection

C. S. BARRETT, SECTION EDITOR

Further Applications of the New Electro-magnetic Test for Detection of Rivet Hole Cracks Developed by the Staatliches Materialprüfungsamt (Erweiterte Anwendungsmöglichkeiten des neuen elektro-magnetischen Verfahrens zur Feststellung von Nietlochrissen der Röntgenstelle beim Staatlichen-Materialprüfungsamt, Berlin-Dahlem). *Wärme,* Vol. 60, Mar. 27, 1937, p. 206. Illustrated report showing modification of electro-magnetic test to enlarge scope of utilization of testing method. EF (9a)

Investigation of a Longitudinal Tear in a Boiler Tube (Untersuchung eines Siederohrrisses) R. WALZEL & R. MITSCHE. *Stahl u. Eisen,* Vol. 57, Mar. 11, 1937, pp. 270-272. Metallographic examination of the tube indicated it had been locally overheated to about 800° C. because of a steam pocket, this no doubt accounting for the failure. SE (9a)

Some Experiences with Wear Testing. PAUL S. LANE (Koppers Co., Am. Hammered Piston Ring Div.) *Am. Foundrymen's Assoc.,* Preprint 37-1, 1937, 38 pp. The apparatus and results obtained in wear testing are described. Some examples of good and poor-wearing irons for steam service are discussed. The effect of structure on wear, effect of grain size, section, and the various elements are considered. CMS (9a)

Investigation of Fissures in Railroad Tires. N. SHCHAPOV & V. KISLIK. *Stal,* Vol. 6, June 1936, pp. 60-66. In Russian. Fissures are caused by inclusions of silicate slag. HWR (9a)

9b. Physical & Mechanical Testing

W. A. TUCKER, SECTION EDITOR

Recent Photomicrographic Apparatus for Corrosion Testing (Neue mikrophotographische Apparaturen für Korrosionsprufungen) A. KUFFERATH. *Korrosion u. Metallschutz,* Vol. 13, June 1937, pp. 189-191. Apparatus for use with incident light and for micro-cinematographic pictures are described. See also *Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 610L/10. Ha (9b)

Determination of Gases in Steel by the Hot-extraction Method. G. THANHEISER. *Engineering,* Vol. 143, Jan. 15, 1937, pp. 78-80. See *Metals and Alloys,* Vol. 8, Apr. 1937, p. MA 206R/8. LFM (9b)

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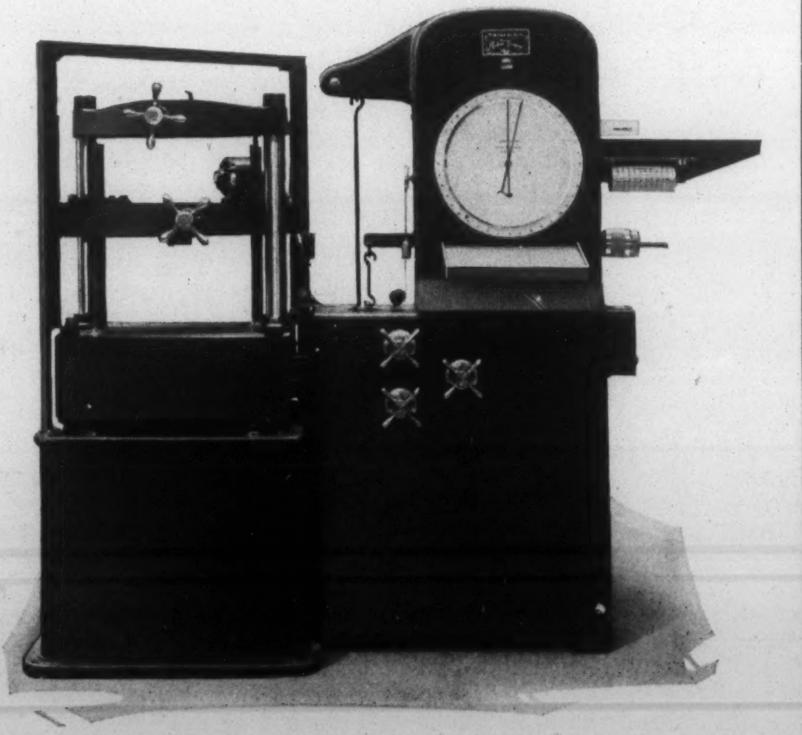

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Measurements at the Yield Point of Soft Steels (Einige Messungen im Bereich der Streckgrenze von weichem Stahl) G. Welter (Tech. Hochschule, Warschau) *Metallwirtschaft,* Vol. 16, Apr. 9, 1937, pp. 345-348. Original research. Yield point phenomena are investigated with emphasis on their relation to test conditions, such as pendulum dynamometer mass, and rate of extension. Loads were applied to tensile machines having different amounts of springiness, which may be classified as rigid, semi-rigid, and soft. No conclusive effect of pendulum dynamometer mass on the stress-strain curve was uncovered. Elastic loading (soft springiness) gives a stress-strain curve showing first a lower yield point and then an upper yield point; at no time does the specimen flow without an increase in load. The drop in load at the yield point in the usual tensile test is ascribed by the author as the effect of rigid loading on the load measuring device. See also *Metals and Alloys,* Vol. 8, May 1937, p. MA 292L/6. GA (9b)

Dynamic Strain Measurements (Dynamische Spannungsmessungen) S. Berg. *Z. Ver. deut. Ing.,* Vol. 81, Mar. 6, 1937, pp. 295-298. Descriptive. Recently developed instruments which measure the elongation of parts in operation and thus the actual dynamic stresses, are described; they are mostly mechanical-optical instruments. The stress is determined from the elongation by Hooke's law. Ha (9b)

Influence of the Testing Machine on the Stress-strain Diagram of Materials (Der Einfluss der Versuchseinrichtung auf das Belastungsschaubild von Werkstoffen) W. Späth. *Metallwirtschaft,* Vol. 16, Feb. 19, 1937, pp. 193-195. Original research. Making use of his mechanical model previously described, the author investigates the plastic region of the stress-strain curve to see if the load diagram is influenced by the testing machine. The elastic spring of the testing machine has considerable effect on the stress-strain curve; a soft spring characteristic giving a curve which shows no drop in load up to breaking, while a hard spring characteristic does show a drop before breaking. It is concluded that a machine with a hard spring characteristic, in contrast to a soft one, is more desirable for obtaining data although the stress at the usual 0.2% strain is more or less influenced by the spring characteristics of the machine. On machines with either soft or hard spring characteristics, the faster rate of testing, the higher the stress-strain curve in the plastic region. See also *Metals and Alloys,* Vol. 7, July 1936, p. MA 360L/9. GA (9b)

Effect of Time on Tensile Properties of Hard-drawn Copper Wire. Albert J. Philips & A. A. Smith, Jr. *Proc. Am. Soc. Testing Materials,* Vol. 36, Pt. II, 1936, pp. 263-273; discussion pp. 274-275. Original research. The effect of time on the flow of hard-drawn Cu wire under sustained loads is studied. An accurate determination of the modulus of elasticity has been made for both soft and hard-drawn Cu wires. Test wires were fastened by swivel clamps at the top, threaded through brass tubing and dead weights suspended at the bottom by means of suitable clamps. Determination of strain was made with a portable microscope, measuring the distance between a knife edge at the bottom of the brass tubing and another knife edge on a small sleeve threaded over the wire. The gage length was 60 in. and the accuracy was ±0.000004 in. per in. From the data obtained the following conclusions are drawn: Hard-drawn Cu wire will creep at room temperature for many days even under loads of only 50% of the tensile strength; the creep characteristics of different Cu wire are similar for a given percentage of their respective tensile strengths; creep characteristics are similar for intermittently and continuously loaded wires for tensile loads not exceeding 78% of the tensile strength; the modulus of elasticity of certain hard-drawn copper wires is 18,000,000 lbs./in.^{2} ±400,000 lbs./in.^{2} and of certain annealed Cu wires 13,400,000 lbs./in.^{2} ±500,000 lbs./in.^{2} VVK (9b)

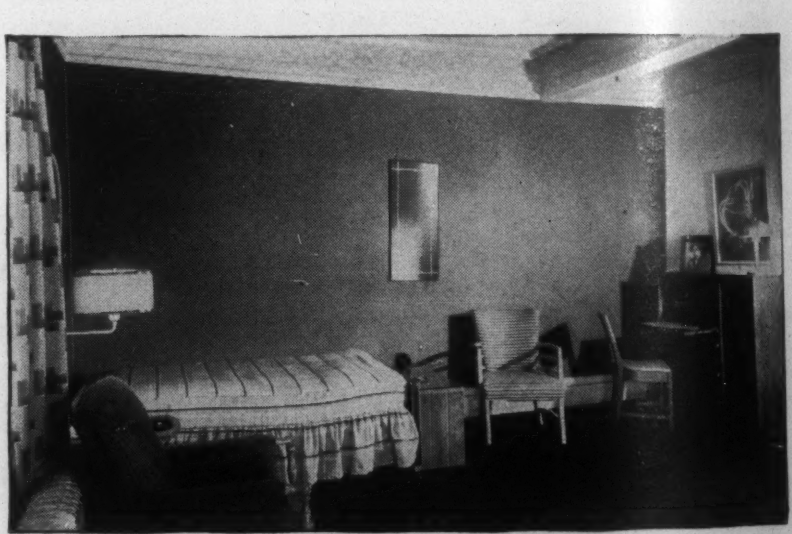
Viewpoints for Standardized Hardness Testing (Richtlinien für einheitliche Härteprüfung) W. Kuntze. *Mitt. deut. Materialprüfungsanstalt., Sonderheft,* No. 38, 1936, pp. 121-124. Reprint from *Tech. Zentralblatt prakt. Metallbearbeit.,* Vol. 46, 1936, No. 15-18. Theoretical research and review. Hardness testing methods applying pre-loading can be adopted for all kinds of testing materials. The diamond cone should be replaced by a diamond (or hard metal) pyramid. The depth of indentation is measured and the load/unit area is taken as the hardness value. The area is derived from the depth measurement. The hardness laws based on the use of cones permit an arbitrary selection of load. The dynamic hardness testers characterized by ease of application cannot be considered as scientific instruments. Erratic results are obtained on steel and cast Fe in comparison with the uniform readings provided by the Brinell machine. The mass of the moving member of the testing instrument and that of the object under test should always be proportional if comparable results are expected. This, of course, can hardly be realized in practice. The same conclusions hold for the rebound hardness tester of Shore and for the Duroskop according to von Leesen. EF (9b)

Plastic Behavior of Metals in the Strain-hardening Range. Part I. A. Nadai (Westinghouse). *J. Applied Phys.,* Vol. 8, Mar. 1937, pp. 205-213. Mathematical treatment of stress-strain relations for the cold working of ductile metals assuming that the stresses of plastic yield depend only on the permanent parts of the strain, and that elasticity and speed of deformation need not be considered. The strain hardening of a ductile metal can be expressed by a function which relates the octahedral shearing stress to the octahedral shear. Using the relations between conventional and natural strains these variables may be defined for strains of finite magnitude. The results are applied to show how stress strain curves of a cold worked metal may be derived from the curve for an annealed metal. Experimental data of Alkins on copper wire treated thus show good agreement between computed and observed tensile strengths up to 30% reduction in area. **Part II.** Evan A. Davis (Westinghouse) *Ibid,* Vol. 8, Mar. 1937, pp. 213-217. Original research comparing the strain hardening effects of tension, compression, and torsion tests performed on Cu bars. Following Nadai the octahedral shearing stress was plotted against the octahedral shear. Good agreement was found between the curves for tension, compression, and torsion for small strains but for severe strains the divergence in the curves becomes marked. This deviation may be due to imparted anisotropy and changes in type of stress distribution. The Vickers hardnesses plotted against octahedral shear for each type of deformation show fairly concordant plots. HFK (9b)

Applications of the Wedge Extensometer. Wilbur M. Wilson. *Proc. Am. Soc. Testing Materials,* Vol. 36, Pt. II, 1936, pp. 807-812; discussion pp. 813-814. Descriptive. The wedge extensometer is an extensometer in which the properties of the wedge are used as a means of multiplying a very small change in distance between two points, thereby making possible a more accurate measurement of the change. The instrument when used by a skilled operator is both reliable and sensitive. It is limited in its field of application but, fortunately, can be used in situations to which other extensometers are not adaptable. VVK (9b)

Investigation of Standard Specifications for Cast Iron (Undersökning av gjutjärnsnormer) Bengt Kjerrman. *Tek. Tid.,* Vol. 67, Apr. 17, 1937 (Section *Mekanik*), pp. 42-48. Review of the official Swedish standard tests for cast Fe, with suggested changes in arbitration bars and procedure. BHS (9b)

Modest or Pretentious—



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Recent Successes in Stress Optics (Neue Erfolge in der Spannungsoptik) L. Föppl. *Z. Ver. deut. Ing.*, Vol. 81, Feb. 6, 1937, pp. 137-141. While the methods so far known for optical determination of stresses give only the stress distribution in a plane a new method by G. Oppel permits determination of this distribution spatially as well. The suitably prepared specimen of a transparent material is then sectionalized and the different slices or discs separately investigated. In order to do this the stress distribution must be made permanent in the volume of the body. This is effected by a certain heat treatment, which is described. 14 references. Ha (9b)

The Technique of Slag-contact Processes (Beitrag zur Systematik von Schlackenabdruckverfahren) H. Dienbauer. *Berg- u. Hüttenmänn. Jahrb.*, Vol. 85, Mar. 30, 1937, pp. 25-27. Niessner's process for making exposures of nonmetallic inclusions in steels is described. Experiments to improve the contours of the photograph showed that an addition of 15% NaCl to the HCl (1:20) solution gives sharp contours. The mechanism and the reactions of the process are discussed and photographs are reproduced. 3 references. Ha (9b)

Flexure and Torsion Testing of Copper Wire. S. E. Borgeson. *Proc. Am. Soc. Testing Materials*, Vol. 36, Pt. II, pp. 249-258; discussion pp. 259-262. Original research. Discusses mechanical properties required of Cu magnet wire and analyzes the various tests used to measure them. A simple type of direct reading torsion tester is described and results of tests by torsion and other methods are compared. The torsion test offers a consistent, accurate method of determining the hardness of wire, especially of soft wire for which tension and elongation tests are not sufficiently sensitive. It gives results consistent with service applications in which the resistance of the wire to flexure is the factor determining its usefulness and enables the hardness of the wire to be specified with reference to a specific testing machine. As a means of studying the effect of annealing schedules and manufacturing processes on wire, the torsion test has a number of advantages including uniform distribution of strains over the length of the test specimen, the possibility of accurate measurement of the strains, and ease and simplicity in operation. VVK (9b)

Impact Bend Testing of Wire. W. J. Farmer & D. A. S. Hale. *Proc. Am. Soc. Testing Materials*, Vol. 36, Pt. II, 1936, pp. 276-290; discussion p. 291. Original research. A discussion of a machine designed to make rapid determination of the ability of wire to resist permanent deformation by bending is presented. A bend tester operated by the impact of a pendulum was developed by the Bell Tel. Labs. in collaboration with Subcommittee IV on Mechanical Tests of the Society's Committee B-4 on Electrical-heating, Electrical-resistance and Electric-furnace Alloys. The test described offers a valuable means of rapidly grading wire (and sheet strip) for use in apparatus where the bending properties are of importance. The efficiency of this instrument under all conditions of operation exceeds 95.7%. The response of different work-hardened materials to annealing varies widely according to the material itself. While under the conditions used, Mo became stiffer, Ni became softer and two Ni-Mo-Fe alloys, although initially extremely stiff became quite soft. In selecting materials for support wires and the like, cognizance should be taken of the widely varying response to heat treatment. Grade A Ni wire appears to vary in bending strength according to the square of the diameter of the piece. The amount of initial work hardening present in a piece of material greatly affects its response to annealing. The amount of work hardening should be considered in any application where annealing conditions are likely to be met. See also *Metals and Alloys*, Vol. 7, May 1936, p. MA 251L/8. VVK (9b)

Test Methods for the Machinability of Light Metals (Prufverfahren für die Zerspanbarkeit von Leichtmetallen). H. Schallbroch. *Aluminium*, Vol. 19. Mar. 1937, pp. 157-164. Review. Methods for judging the machinability and ability to form a desirable chip are described. Curves for Al, Silumin and Lautal are given as illustrations of the application of the methods. Ha (9b)

Testing of Magnet Steels (Ueber die Prüfung von Magnetstählen). H. Lange. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch., Düsseldorf*, Vol. 19, No. 6, 1937, pp. 87-96. Descriptive. Points to be observed in testing of modern permanent magnets with high product of remanence and coercive force are explained and testing methods described. 8 references. Ha (9b)

The Production of Polarized Light. R. S. Weller. *Eng. Expt. Sta. News, Ohio State Univ.*, Vol. 9, Apr. 1937, pp. 14-16. The advantages of using polarized light in determining properties of metals are briefly discussed, and means are described to produce it, other than by Nicol prisms, by scattering or Zeeman effects. Ha (9b)

9c. Fatigue Testing

H. F. MOORE, SECTION EDITOR

The abstracts appearing under this heading are prepared in co-operation with the A.S.T.M. Research Committee on Fatigue of Metals. The purpose of this cooperation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor.

Fatigue Fracture and Brittle Fracture (Dauerbruch und spröder Bruch) A. Smekal (Martin Luther-Univ.). *Metallwirtschaft*, Vol. 16, Feb. 19, 1937, pp. 189-193. Theoretical discussion. The appearance of the typical tensile fatigue fracture and of the tensile fracture of a brittle material such as glass are similar. The primary fracture surface in both cases is a relatively smooth surface perpendicular to the specimen axis, bounded by a circle, the place of initial failure being at the center of the circle. The remainder or secondary part of the fracture surface is rough and often not in the same plane as the primary fracture. The author describes at length his conceptions of the process of brittle fracture and fatigue fracture which lead him to arrive at the conclusion that in spite of the differences in manner of stressing and nature of material the peculiar fracture surface is formed in a similar manner, though at different rates. GA (9c)

Reproducibility of Results of the Determination of Elastic Stresses by X-rays (Ueber die Wiederholbarkeit der Ergebnisse bei der Bestimmung von elastischen Spannungen mit Röntgenstrahlen) H. Möller & F. Gisen. *Mitt. Kaiser-Wilhelm-Inst. Eisenforsch. Düsseldorf*, Vol. 19, No. 4, 1937, pp. 57-59. Comparative experiments on accuracy and reproducibility of determinations of lattice constants by X-rays were made independently in 2 different laboratories. The errors in the evaluation of the films were of the order of ±1 x 10^{-4} A.V. The method of making exposures is explained in detail. Ha (9c)

Resistance to Damage by Overstress of Precipitation-hardened Copper-steel and Copper-malleable. H. W. Russell (Battelle Mem. Inst.). *Metals and Alloys*, Vol. 7, Dec. 1936, pp. 321-323. Review plus original research. Low notch sensitivity and marked resistance to overstress are caused by the precipitation of submicroscopic particles of Cu during the precipitation hardening treatment. Special reference is made to the Ford crankshaft. Comments by R. H. McCarroll, Ford Motor Co. and also by G. R. Brophy, General Elec. Co., are appended. GEG (9c)

Operation of Repeated Bend Machines in the Vibration Range of the Specimen (Betrieb von Wechselprüfmaschinen im Eigenschwingungsbereich der Problen) W. Späth. *Arch. Eisenhüttenw.*, Vol. 10, Jan. 1937, pp. 313-315. A repeated bend machine in which the vibration range of the cantilever specimen is controlled by a crank is described. SE (9c)

9d. Magnetic Testing

L. S. REID, SECTION EDITOR

Electro-magnetic Testing of Wire Ropes. T. F. Wall. *Trans. Inst. Mining Engrs.*, Vol. 91, Part 2, May 1936, pp. 104-123; Discussion, June 1936, pp. 219-220. See *Metals and Alloys*, Vol. 7, May 1936, p. MA 252L/3. AHE (9d)

9e. Spectrography

G. R. HARRISON SECTION EDITOR

Quantitative Spectroscopic Analysis of Steels Using the Occhialini Method (Analisi spettroscopica quantitativa di acciai col metodo Occhialini) S. Pastore (Genoa Univ.) *Met. Ital.*, Vol. 29, Apr. 1937, pp. 163-167. The method has been applied for determining the following elements in steel: C, Cr, Ni, S, Si, P, Ti, Mn, Mo, W and V. In all cases a thin plate of steel of the same size is placed between 2 C electrodes and the length of the lines measured. Graphs have been plotted for length of line vs. % of element, for all the above elements. Determinations within 2-6% can be made using this method which requires only 10 min. to perform. AWC (9e)

Remarks on Quantitative Spectroscopic Analysis (Methodische Bemerkungen zur quantitativen Spektralanalyse) H. Kaiser (Zeisswerk) *Metallwirtschaft*, Vol. 16, Mar. 26, 1937, pp. 301-306. Review. The author discusses the applicability of the spectroscope to the precise analysis of metals. The accuracy obtainable is emphasized by specific examples. GA (9e)

10. METALLOGRAPHY

J. S. MARSH, SECTION EDITOR

The Crystal Structures of Cr_2Al and Cr_5Al_8. A. J. Bradley & S. S. Lu (Univ. Manchester) *Z. Krist.*, Vol. 96, Feb. 1937, pp. 20-37. In English. Original research. 11 phases were found by X-rays in the Cr-Al system. The structure of 2 phases was solved; the remainder are more complicated. At high temperatures, the body-centered cubic solid solution of Al in Cr exists from 0-30% Al, i.e. well beyond the composition Cr_2Al. On slow cooling at about 850° C. alloys with 25% Al change from the body-centered cubic α phase to a tetragonal β phase by an ordering process. A superlattice is formed by stacking 2 body-centered cubes one above another. Space group $= D^{17}_{4h}$. Dimensions of the unit cell: $a = 2.9984$ A.U., $c = 8.63$ A.U. $c/a = 2.878$. (Composition 78.5% Cr.) The composition range of β Cr-Al does not include the ideal composition Cr_2Al even after the most favorable heat treatment. Alloys made up to the exact composition Cr_2Al contain 2 phases, the tetragonal Cr_2Al structure and body-centered cubic phase. This behavior compares with that of the θ phase of the Cu-Al system where homogeneity is found only if there is an excess of Al. The next phase in slowly cooled alloys includes the composition Cr_5Al_8, the X-ray powder photograph of which shows a marked resemblance to Cu_5Zn_8 (γ-brass) but the pattern is more complicated. There are clusters of 26 atoms grouped around points corresponding to cube corners and cube centers, but the cube is slightly distorted by elongation in the direction of a trigonal axis. The symmetry is no longer cubic but rhombohedral. The space group of Cr_5Al_8 is C^5_8 and the atomic coordinates are such that there is practically no displacement from the corresponding positions in Cu_5Zn_8. EF (10)

Transformations During Cooling of Steel (Les Transformations au Refroidissement des Aciers) Albert Portevin & Pierre Chevenard. *Compt. Rend.*, Vol. 204, Mar 8, 1937, pp. 772-774. Original research. The rapid cooling of a series of Ni-Cr steels was interrupted by immersion of the samples in baths at elevated temperatures for a period varying from 1 min. to several hr. with subsequent quenching in ice water. From dilatometric measurements and microscopic examination, the authors corroborate the results of Bain and Davenport. The Ar_1 transformation consists in the germination and crystallization of cementite and the Ar_3 in the formation of super-saturated ferrite which may decompose partially or totally by the precipitation of carbides. FHC (10)

Variants Influencing Austenite Grain Size as Determined by Standard Methods. R. Schempp & C. L. Shapiro. *Metals Technology*, Jan. 1937, *American Institute Mining & Metallurgical Engineers, Technical Publication* No. 765, 15 pages. Review plus original research. A study of grain size of C steels with 1% C showed that a number of variants may influence austenite grain size. These include prior structural condition, which is in turn dependent on prior heat treatment, the amount of hot or cold deformation, and the inherent characteristics of the melt. All of these influence the McQuaid-Ehn grain size, and for this reason in specifying grain size, the grain size observed in actual service conditions rather than the grain size at an arbitrary temperature should be specified. It is concluded that although the grain-size rating is valuable if properly interpreted, any differences in grain size that may be observed by the partly processed or finished-processed stock are not necessarily inherent characteristics of the melt. See *Metals and Alloys*, Vol. 8, Jan. 1937, page MA 35L/5. JLG (10)

Hardening, Deformation, and Recrystallization of Lead-antimony Alloys (Aushärtung, Verformung und Rekristallisation von Blei-Antimon-Legierungen) W. Hofmann, A. Schrader & H. Hanemann (Tech. Hochschule, Berlin) *Z. Metallkunde,* Vol. 29, Feb. 1937, pp. 39-48. Experimental research. Hardness measurements, microscopic observation, and X-ray measurements were made on alloys of Pb of 99.96 and 99.99% purity with 0.5, 1, and 2% Sb. Rates and degree of hardening are increased by minute impurities. Aging at 100° is accompanied by observable precipitation. No observable precipitation occurs during aging at room temperature but X-ray and conductivity evidence indicate the beginning of submicroscopic precipitation. The hardness is increased by deformation but this decreases with time at room temperature, owing to recrystallization. Recrystallization is accompanied by observable precipitation. Annealing deformed samples at 100° results in precipitation and softening without recrystallization. GD (10)

Recrystallization of Steel During Hot Deformation by Pressure. I. M. Pavlov, L. S. Gelderman & A. I. Jhukova. *Metallurg,* Vol. 11, Dec. 1936, pp. 3-14. In Russian. Original investigation in which 30 x 20 mm. specimens of C steel were deformed by impact at temperatures from 800-1150° C. and annealed for 40 min. at the temperature of the experiment. The amount of actual deformation was determined by the changes in pitch diameter of a screw inserted in the cylinders along their axis before deformation. This deformation was different from average deformation based on the shape of specimens universally used by previous investigators. Grain size corresponding to actual deformation was determined under a microscope and both plane and space diagrams showing the relation between degree of deformation and temperature were plotted, and were compared with diagrams available in the literature. Each specimen furnishes sufficient points to plot a recrystallization diagram. Grain size was non-uniform, increasing as a rule towards the base where deformation was close to critical. In none of the experiments was a maximum deformation observed in the center of specimens. The Hanemann and Lucke method apparently does not clearly show the phenomena near critical deformation. The diagrams generally show larger grain size than those based on total or average deformation. This is particularly pronounced in critical ranges and in the temperature range 800-850° C. The grain size finally obtained is a function of the original grain size. (10)

The Microscopic Study of Lead and Lead Alloys (Ueber die Mikroskopische Untersuchung von Blei und Blei-Legierungen) A. Schrader & H. Hanemann (Tech. Hochschule, Berlin) *Z. Metallkunde,* Vol. 29, Feb. 1937, pp. 37-9. Descriptive. Micrographs are presented to show that all fine details of structure can be developed by using the ordinary soft metal metallographic technique. Recrystallization at room temperature is shown in various stages for a Pb-2% Sb alloy. GD (10)

Ferromagnetic Transformation and Catalytic Activity IV. Hydration of CO and C_2H_4 over Nickel and Formation of CO_2 from CO over the Heusler Alloy $MnAlCu_2$ (Ferromagnetische Umwandlung und katalytische Aktivitat IV. Hydrierung von CO und C_2H_4 über Nickel und CO_2-Bildung über der Heusler-Legierung $MnAlCu_2$) J. Arvid Hedvall & Rune Hedin. *Z. physik. Chem.*, Abt. B., Vol. 30, Nov. 1935, pp. 280-288. Original research. In continuation of investigations on the effect of the loss of ferromagnetism of a Ni catalyzer on the reactions: $N_2O = N_2 + O$ and $2CO = CO_2 + C$ (See*Metals and Alloys,* Vol. 6, July 1935, p. MA 297L/1, and Vol. 7, Mar. 1936, p. MA 142R/10), a discontinuous change in the course of the processes mentioned in the title has been observed within the temperature interval of the Curie transition of the catalyzers. That of the used Ni is given in the former papers, that of the Heusler alloy $MnAlCu_2$ begins shortly above 330° C., the steep drop occurring at about 340° C. ORS (10)

Relation of the Specific Heat of Ag_2HgI_4 to Crystal Structure (Die spezifische Wärme von Ag_2HgI_4 im Zusammenhang mit der Kristallstruktur) J. A. A. Ketelaar. *Z. physik. Chem.,* Abt. B, Vol. 30, Sept. 1935, pp. 53-60. Original research. The true specific heat of Ag_2HgI_4, determined within the temperature interval from 20° to 100° C., increases anomalously from 37° C. on, attaining shortly below 50.7 ± 0.2° C., (the temperature of the discontinuous part of the β-Ag_2HgI_4—α-Ag_2HgI_4 transformation) a value 3 times greater than normal. The heat of transformation at this temperature is 1.04 kg. cal./mol; that of the continuous part of this transformation which, according to the author's previous findings precedes the former one, is 0.295 kg. cal./mol. The specific heat anomaly is interpreted in terms of the crystal structure of the β and the α modification. Even at temperatures below that of the discontinuous part of the transformation, increase of temperature causes an ever increasing number of metal atoms to occupy disorder positions. Whereas X-ray spectrograms of α-Ag_2HgI_4 admit of two interpretations of its "averaged structure," namely: as a statistical distribution of the atoms or as a multiplet structure ("Wechselstruktur"), the latter is frequently overlooked in crystal structure considerations; results of determinations of the electric conductivity and of the true specific heat of Ag_2HgI_4 indicate positively that in the crystal lattice of the α modification the I atoms are arranged approximately in a close-packed cubic lattice and the 3 metal atoms (1 Hg and 2 Ag) per unit cell are distributed statistically on the fourfold positions of the face-centered cubic lattice. ORS (10)

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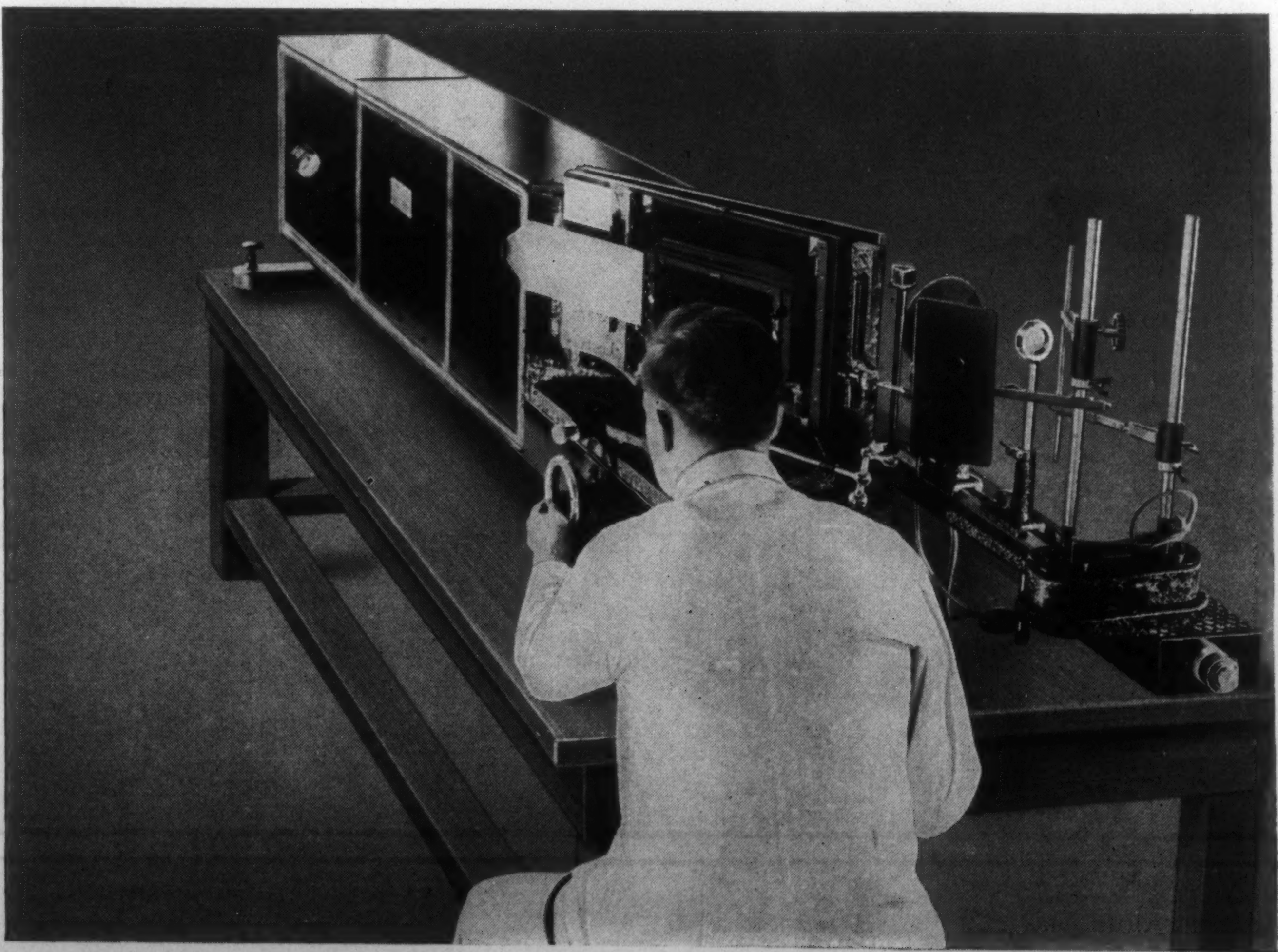

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Phenomena Occurring on Drawing Quenched Carbon Steel. N. T. Gudstov, F. Baranov & O. Kuzmina. *Metallurg,* Vol. 12, Jan. 1937, pp. 9-20. In Russian. Original research. Steels containing 0.8% C, 0.2% Si, 0.2% Mn and 1.25% C, 0.2% Si, 0.2% Mn were investigated. Dilatometric curves show that the transformation of tetragonal to cubic lattice in quenched steel takes place between 150°-200° C. for 0.8% C. and 125°-200° C. for 1.2% C steel, the difference in the beginning of transformation range being related to C content. The curve then flattens due to the transformation of tetragonal martensite into cubic martensite. Transformation of austenite into cubic martensite occurs between 200° and 320° C., which corresponds to a rise in the curve. The latter then drops owing to the contraction caused by decomposition of martensite associated with formation of molecular carbides and the transformation of the latter into cementite. The latter reaction can be studied by magnetic analysis only. The method indicates that a sharp change in magnetic permeability takes place beginning at 150-160° C.; this change is caused by magnetic transformation of cementite. Temperature range of magnetic transformation is inversely proportional to the temperature of the preceding draw; specimens drawn at 300° C. transform magnetically between 150 and 300° C., those drawn at 650° C. transform completely between 160 and 200° C. The effect of magnetic transformation drops sharply at drawing temperatures above 500° C. owing to coagulation of cementite The results of these observations were checked by X-ray analysis. Decomposition of martensite accompanies the formation of carbide molecules which have no crystalline orientation, but which form crystals on heating in the range 350°-450° C. (10)

Structure of the Zinc-cadmium Eutectic (Der Aufbau des Zink-Cadmium-Eutektikums) M. Straumanis & N. Brakss. *Z. physik. Chem.,* Vol. 30 (B), Oct. 1935, pp. 117-131. Original research. The Zn-Cd eutectic consists, at low magnifications, of rather coarse fibers each of which has a laminar, truly eutectic structure observable only at high magnifications. These "eutectic fibers" consist over their entire length of parallel laminae of Zn and Cd crystals whose diagonal axes of the first position [0110], as determined from X-ray rotation spectrograms, coincide or form an angle of up to 5° with the axis of the fiber, while their wide base surfaces are in contact with each other. The laminae are frequently warped. The fineness of the eutectic structure increases from 600 double (Zn + Cd) layers per mm. in very slowly cooled or annealed, to over 2000 double layers per mm. in quenched alloys. After an extensive discussion the authors conclude that both constituents crystallize simultaneously, the laminae growing perpendicularly to the cooling surface. The structure of the eutectic depends primarily on crystal-physical properties of the constituents, and the surface tension has, most likely, but a secondary effect. Contrary findings and conclusions of Vogel (*Z. anorg. allgem. Chem.,* Vol. 76, 1912, pp. 425-436) were due to too low magnifications. ORS (10)

Allotropic Transformations in Iron. T. A. Lebedev. *Metallurg,* Vol. 12, Jan. 1937, pp. 40-46. In Russian. Review plus original research. Results presented by H. Esser were examined from a new standpoint. Esser reported that allotropic transformations found in electrolytic Fe by means of a dilatometer increase in intensity on repeating the experiments. He attributed this to elimination of H_2. Lebedev assumes that C is non-uniformly distributed in Armco Fe so that it might be totally absent in some individual grains. Straining the metal and allowing it to recrystallize would produce comparatively large grains free from C. Repeated heating above the critical point would redistribute C uniformly producing a corresponding change in the dilatation curve. A series of experiments conducted on specimens so prepared indicated stabilization of the dilatation curve after the fourth heating. Esser's conclusion that absolutely pure Fe has no allotropic transformations was supported. (10)

The Allotropy of Iron. H. Esser (Aachen, Germany) *Iron & Steel Inst., London, Carnegie Schol. Mem.,* Vol. 25, 1936, pp. 213 to 234. Original research. Claims that H in Fe causes the A_3 point to be doubled, and that the A_3 transformation observed is due to the presence of impurities; in pure Fe he claims no A_3 transformation would exist. He assumes that the impurities are embedded in the boundaries or interstices of the crystalline blocks making up the mosaic-like character. 20 references. [His conclusions are far from convincing. He used specimens 3 to 4 mm. in diam. and 0.1 to 0.5 mm. in thickness and spot welded to them Pt-Pt Rh thermoelement wires. By using this procedure there is a danger of contamination resulting and of hydrogen being absorbed by the Pt.—C.W.] CW (10)

Oxygen in Steels. I—Determination of Total Oxygen (L'Ossigeno negli acciai. I—La determinazione dell'ossigeno totale) I. Musatti & G. Ziliani (Ernesto Breda Tech.-Scientific Inst.) *Met. Ital.,* Vol. 29, Mar. 1937, pp. 99-120. An extensive review with 53 references. AWC (10)

Ferrite—Its Occurrence and Control in Gray Cast Iron. R. H. Bancroft (Perfect Circle Co.) & A. H. Dierker (Ohio State Univ.) *Am. Foundrymen's Assoc.,* Preprint 37-9, 1937, 10 pp. The authors in their studies of certain very light sectioned castings found ferrite areas in castings whose C content was somewhat below normal. When C content was increased, the ferrite disappeared. This paper reports studies and concludes that any given Fe has a definite range of cooling rates within which a normal pearlitic structure will be found. Higher or lower cooling rates will tend to form different types of ferrite designated by the authors as primary ferrite and secondary ferrite. CMS (10)

The Crystal Structure of Ni_3Sn (Die Kristallstruktur des Ni_3Sn) R. Rahlfs. *Metallwirtschaft,* Vol. 16, Apr. 9, 1937, pp. 343-345. Original research. The crystal structure of Ni_3Sn was determined by means of the Debye-Scherrer method. Ni_3Sn crystallizes with the Mg_3Cd structure, hexagonal close-packed with a super structure, which may be described as a doubling of the a axis. The lattice data are: $a' = 2a = 5.275$ A.U.; $c' = c = 4.234$ A.U., and $c/a' = 0.803 = \frac{1}{2} \times 1.606$. GA (10)

Form of Carbon in Iron Solid Solution. T. A. Lebedev. *Metallurg,* Vol. 11, Dec. 1936, pp. 59-63. In Russian. Original research. Carburizing can occur as a result of: (1) penetration of C atoms into Fe space lattice, (2) formation of Fe_3C molecules and solution in iron, (3) formation of Fe_3C molecules, which decompose into atomic C, which dissolves in γ iron. Experimental data were inconclusive. (10)

Controlled Grain Size in Steel. T. Swinden & G. R. Bolsover. *Foundry Trade J.,* Vol. 55, Oct. 1, 1936, p. 257; *Engineer,* Vol. 162, Oct. 9, 1936, p. 388 and Nov. 6, pp. 486-487; *Heat Treating Forging,* Vol. 22, Nov. 1936, pp. 554-559, Dec. 1936, pp. 614-619, 625-626; **(Korngrössüberwachung beim Stahl).** *Stahl u. Eisen,* Vol. 56, Sept. 17, 1936, pp. 1113-1124; *Sheet Metal Ind.,* Vol. 10, Nov. 1936, pp. 841-844; *Metal Treatment,* Vol. 2, Autumn 1936, pp. 136-141, 143; *Blast Furnace Steel Plant,* Vol. 25, Jan. 1937, p. 117. See *Metals and Alloys,* Vol. 8, May, 1937, p. MA 300R/6.
AIK + LFM + MS + SE + VSP+ AWM + JCC (10)

Work Figures in Aluminum-magnesium Forging Alloys (Kraftwirkungsfiguren an Aluminium-Magnesium-Knetlegierungen). W. Roth. *Z. Metallkunde,* Vol. 28, Dec. 1936, pp. 388-389. A metallographic study shows that cold working plus aging Al-Mg alloys accelerates the precipitation of Al_3Mg_2, especially on slip planes. GD (10)

The Detection of Changes in Solid Metals (Ueber die Erkennung von Umwandlungen bei Metallen im festen Zustande) W. F. Brandsma & E. M. H. Lips (Philips-Gloeilampfabrieken) *Z. Metallkunde,* Vol. 28, Dec. 1936, pp. 381-382. Original research. The A_1 point at 730° C., in a 0.16% C steel, was shown by a sharp change in torsion angle, along with another unexplained change at 756°. Torsion curves on cold-worked Al showed two transition points: one at 300°, independent of the amount of cold work and attributed to a change from crystalline to amorphous plasticity, and a second, connected with the completion of recrystallization. GD (10)

Inner Characteristics of the Deformation and Fracture of Metals under Static and Fatigue Stresses, as Revealed by X-rays. H. J. Gough. *De Ingenieur,* Vol. 51, Aug. 21, 1936, pp. Mk 21-22; Sept. 18, 1936, pp. Mk23-Mk25. In English. *Iron & Coal Trades Rev.,* Vol. 134, May 14, 1937, p. 894. General discussion. See *Metals and Alloys,* Vol. 8, Feb. 1937, p. MA 96R/5. Ha (10)

Modern Theory of Solids. Frederick Seitz (Univ. Rochester) & R. P. Johnston (Gen. Elec. Co.) *J. Applied Phys.,* Vol. 8, Feb. 1937, pp. 84-97; Mar. 1937, pp. 186-199; Apr. 1937, pp. 246-260. Series of articles written in popular style giving a general survey of physical theories of properties of solids. The history is traced from Lorentz's theory of metals (1905) to the modern "zone" theory. The latter theory is applied in turn to (1) pure metals, (2) ionic crystals, (3) valence crystals, (4) semiconductors, and (5) molecular crystals to show how it explains their peculiarities. The success or lack of success of the theory in explaining thermal properties, phase changes, elastic constants, crystal structure, optical absorption, photoconductivity, metallic conduction and magnetic behavior is discussed. Application of the zone theory to surface properties such as adsorption, thermionic emission, and contact rectification; to the change of volume properties by impurities as in fluorescence and phosphorescence and to the plasticity and strength of crystals is also reviewed. HFK (10)

Recent Investigations on Polycomponent Systems Including Iron Oxides (Neuere Forschungen über Mehrstoffsysteme mit Eisenoxyden) H. ZUR STRASSEN. *Fortschr. Mineral., Krist. Petrog.*, Vol. 20, Part II, 1936, pp. 239-289. Extensive, up-to-date review based on 65 international publications under the following headings: (1) The system Fe-O: (a) section Fe-Fe_3O_4 (b) section Fe_3O_4-Fe_2O_3. (2) Systems with FeO: (a) FeO-SiO_2 (b) MgO-FeO-SiO_2 (c) CaO-FeO-SiO_2 (d) FeO-SiO_2. (3) Systems with Fe_2O_3: (a) Fe_2O_3-SiO_2 (b) Na_2SiO_3-Fe_2O_3-SiO_2 (c) CaO-Fe_2O_3-SiO_2 (d) CaO-Al_2O_3-Fe_2O_3 (e) CaO-Al_2O_3-Fe_2O_3-SiO_2 (f) Fe_2O_3-P_2O_5. (4) Systems with Fe-oxides of various valency: (a) FeO-Fe_2O_3-SiO_2 (b) MgO-FeO-Fe_2O_3 (c) CaO-Fe-Fe_2O_3. The original must be consulted for details. EF (10)

On the Action of Metallic Barium on Barium Oxides at High Temperatures (Ueber die Einwirkung von Barium Metall auf Barium Oxide bei höheren Temperaturen) MAXIMILIAN SCHRIEL. *Z. anorg. allgem. Chem.*, Vol. 231, Apr. 8, 1937, pp. 313-326. An exhaustive experimental study showing that the often mentioned barium "suboxide," a red colored barium oxide obtained by the action of Ba on BaO, is due to a slight solution of Ba in BaO and is not the hypothetical Ba_2O. It is shown that BaO is soluble in Ba varying from about 20 wt.% BaO at 725° C. to about 50 wt.% at 1200° C. HFK (10)

Rates of Diffusion in Solid Alloys. ROBERT F. MEHL (Carnegie Inst. Tech.) *J. Applied Phys.*, Vol. 8, Mar. 1937, pp. 174-185. Comprehensive review. Supplements previous work (see *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 167L/10) with a review of recent diffusion data, in which an attempt is made to evaluate the effect on diffusion rates of the 4 factors: atom size, melting points, degrees of solid solubility, and relative positions of components in the periodic table, considering in turn 3 types of binary systems: (1) simple solid solution systems, (2) systems of the metals, Cu, Ag, and Au with B subgroup metals, and (3) systems in which the solvent metal is of the Pb or Hg type. Tables are given listing the limiting diffusion rates of various metals in Pb, Cu, Ag, and Au. Original research on the systems Cu-Al, Cu-Si, Cu-Sn, and Cu-Zn has shown a variation of the diffusion constant D and the heat of activation Q with concentration. For Cu-Al a plot of Q against $(\text{at.}\%)^2$ gives a straight line. The assembled data show that the electrovalency effects are of major importance while atom sizes and melting points are of secondary importance in determining diffusion rates. HFK (10)

Solubility of Indium in Mercury from 0° to 50° C. W. GEORGE PARKS & WALTER G. MORAN (Rhode Island State College) *J. Phys. Chem.*, Vol. 41, Mar. 1937, pp. 343-349. Original research. In amalgams were prepared by the direct addition of a weighed quantity of metal to a weighed quantity of Hg. The solubility of In in Hg, determined at 0°, 12.5°, 25°, 37.5° and 50° C., can be expressed by the following equation:

$$\log N_2 = \frac{53.57}{T} + 1.714$$

wherein N_2 = weight fraction of In in the saturated amalgam. The difficulties involved in the determination of a homogeneous phase by filtration are pointed out. The solubility of In in Hg indicates that In has a rather high internal pressure, approximately the same as that of Pb. From its general behavior, In-Hg is believed to be suited for precise e.m.f. measurements. 25 references. EF (10)

The Nickel-aluminum Equilibrium Diagram. HIDEO NISHIMURA & SATOSHI WATANABE. *Suiyokwai-Shi*, Vol. 9, Feb. 1937, pp. 153-158. Original research. The Ni end of the Ni-Al diagram was investigated thermally and microscopically and a new diagram proposed. Within the range investigated (0—20% Al), $\beta\,Ni_4Al$ forms from the melt at 10.3% Al and undergoes the following eutectoid transformation:

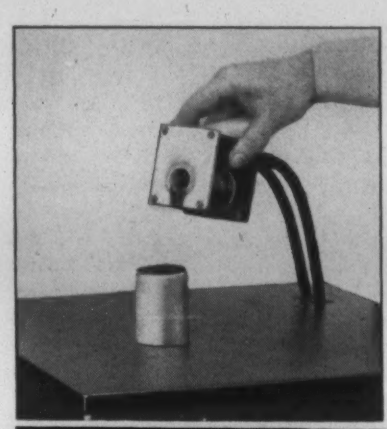
$$\beta \rightleftarrows \alpha + \gamma \text{ at } 1060^\circ \text{ C.}$$

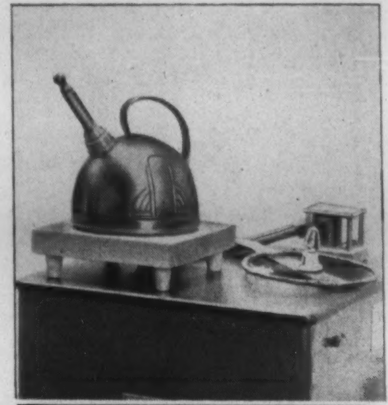
The following eutectic reactions have also been observed at about 9.5% Al respectively:

$$\text{Liq.} \rightleftarrows \alpha + \beta \text{ at } 1270^\circ \text{ C.}$$
$$\text{Liq.} \rightleftarrows \alpha + \gamma \text{ at } 1300^\circ \text{ C.}$$

HN (10)

The Discovery of Braggite. F. A. BANNISTER. *Z. Krist.*, Vol. 96, Mar. 1937, pp. 201-202 In English. Original research. Describes the separation of the mineral constituents of the concentrates from the platiniferous norites of the Rustenburg and Potgietersrust districts, Transvaal, yielding Cooperite, PtS (tetragonal, a = 4.91 A.U., c = 6.10 A.U., space group = D^9_{4h} =P 4/mmc., structure type B 17) and Braggite, (Pt, Pd, Ni)S (tetragonal, a = 6.37 A.U., c = 6.58 A.U., space group C^2_{4h} = P 4_2/m. or C^3_4 = P 4_2). EF (10)





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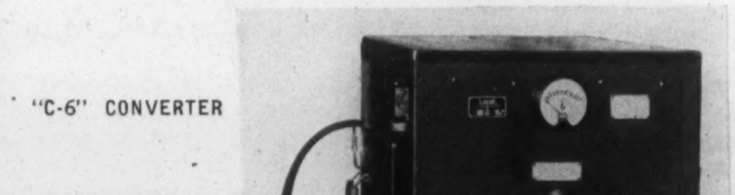

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A Noteworthy Example of Inverse Segregation (Ein bemerkenswerter Fall von umgekehrter Blockseigerung) W. CLAUS (Tech. Hochschule, Berlin) *Z. Metallkunde,* Vol. 28, Dec. 1936, pp.. 391-393. Original research. Alloys of 85 and 72% Cu with Sn, Pb, Ni were studied by chemical analysis and radiographic methods and it was shown that inverse segregation is related to stresses generated during cooling. GD (10)

The Intermediate States in the Formation of $ZnAl_2O_4$ from ZnO and Al_2O_3 in the Solid State. No. 14. Contributions on Reactions in the Solid State at Elevated Temperatures (Die Zwischenzustände die bei der Bildung des Zinkaluminates aus ZnO und Al_2O_3 in festen Zustande auftreten. 14. Mitteilung über Reaktione im festen Zustand bei höheren Temperaturen) WILHELM JANDER & KARL BUNDE. *Z. anorg. allgem. Chem.,* Vol. 231 Apr. 8, 1937, pp. 345-364. An experimental study of the reaction in the solid state between ZnO and Al_2O_3. The extensive data confirm some previous views on the course of the reaction which is thought to pass through the following stages as the temperature is raised: (1) 0-400° C., surface reactions in which intermediate molecules are formed. (2) 400-700° C., formation of a thin reaction sheet. (3) 700-900° C., alterations in the reaction sheet due to the growth of new crystal nucleii into imperfect crystals. (4) above 900° C., transformation of imperfect crystals to ideal crystals. HFK (10)

Laws of Transformation of Austenite into Martensite. S. A. KAZEEV. *Metallurg,* Vol. 11, Dec. 1936, p. 51-58. In Russian. Equations developed by the author, (*Metals and Alloys,* Vol. 7, Dec. 1936, p. MA 599L/3) for decomposition of austenite at constant temperatures were checked for decomposition at dropping temperatures. Specimens were heated to 900° C. and cooled in air. Their properties were determined in a magnetometer every few seconds. The values determined and calculated by the author's formula closely agreed in a majority of cases. By extending the experiments to 3 more types of steel cooled in air and plotting the amount of decomposition against time on logarithmic coordinates, it was shown that breaks in cooling curves do not exactly coincide with stages of austenitic transformation; transformation proceeds in any case slower at the beginning and much faster when a certain point, different in each instance, is passed. For a steel with 1% C and 7% Cr., a break can be observed on the cooling curve at 600° C. which corresponds to austenite-troostite transformation, but it can be seen only when about 3% of austenite is decomposed. Transformation slows down considerably at 400° C., no further action taking place until at 220° C. austenite-martensite change, clearly shown on both curves, occurs. In most cases the critical point of the beginning of transformation determined on the cooling curve does not correspond to the beginning of transformation but to some intermediate stage thereof. The results are supported mathematically. (10)

Influence of Copper, Iron, Silicon, Manganese, Magnesium and Titanium on Recrystallization of Duralumin Type Alloys. K. I. BOKUNYAEVA & E. M. HELFAND. *Tsvetnye Metall.,* No. 8, Sept. 1935, pp. 111-117. Original research on alloys with 3.5 to 5% Cu, 0.5 to 1.4% Mg, 0.5 to 1.5% Mn, 0 to 1.7% Ti, 0.03 to 2.0% Fe and 0.03% to 2.0% Si, singly or in combinations. Samples of alloys were deformed by compressing or rolling, then heated at 550° C. and cooled in air. The samples were then again deformed on Brinell press and again heat treated as before. It was concluded that: (1) Addition of Cu up to 4.5% decreases the grain size in the primary and secondary recrystallization zones; further addition of Cu has no effect on grain size. (2) Ti decreases grain size in primary recrystallization zone; in the secondary, the addition of Ti up to 0.3% increases, and above 0.5 to 1.7% decreases the grain size (3) Addition of 0.5 to 1.4% Mg has no effect on grain size. (4) Mn in amounts from 0.5 to 1.0% increases the grain size, but above 1.5% decreases it in the primary recrystallization zone; in the secondary recrystallization zone Mn decreases grain size. (5) Increase of Fe content from 0.5 to 2.0% refines the grain both in the primary and secondary zones. (6) Si increases grain size in primary recrystallization zone and decreases it in the secondary. BND (10)

The Lattice Spacing of Iron-nickel Alloys. A. J. BRADLEY, A. H. JAY & A. TAYLOR. *Phil. Mag.,* Vol. 23, Apr. 1937, pp. 545-557. Gaps in knowledge of structure of Fe-Ni alloys and the inherent difficulties of measuring the constants are discussed. Results on 35 Fe-Ni alloys are given, according to which the lattice spacings of the Fe-rich body-centered cubic alloys increase from 2.8605 A.U. for pure Fe to 2.8644 A.U. for 5.7 atomic % Ni. In the 2-phase region the lattice spacing is 2.8635 A.U. The lattice spacings of the face-centered cubic Ni-rich alloys increase from 3.5169 A.U. for pure Ni to a max. of 3.5878 A.U. at 38.69 atomic % Ni and then drop to 3.5741 A.U. at 28% Ni. The lattice spacings are different after quenching from 700, 800, 900° C. It is intimated that these variations may be correlated with variations in the magnetic properties of the alloys. Ha (10)

Changes in Mechanical Stresses during the Austenite-martensite Transformation (Aenderungen von mechanischen Spannungen bei der Austenit-Martensit-Umwandlung) E. SCHEIL & W. THIELE. *Arch. Eisenhüttenw.,* Vol. 10, Apr. 1937, pp. 477-480. The γ-α transformation was studied in wires of 27% Ni steel in which the transformation took place at a low temperature even on slow cooling. The stresses set up in the wire were determined by a torsional method and under light torsional loading. At the moment the transformation began the steel became very plastic and the tendency to set up stresses was rapidly dissipated. The plasticity was limited, however, and work hardening soon occurred. Subsequent volume changes set up stresses. The high plasticity at the start of the transformation was the cause of the residual internal stresses, these being higher the greater the temperature gradient between the outside and center of the specimen during the transformation. SE (10)

Microscopic and X-ray Study of Precipitation in Nickel-beryllium Alloys (Mikroskopische und röntgenographische Untersuchung der Ausscheidung bei Nickel-Beryllium-Legierungen) H. LAY (Kaiser-Wilhelm-Inst. Metallforsch.) *Z. Metallkunde,* Vol. 29, Jan. 1937, pp. 32-33. Original research. Alloys of Ni with 1.9% Be were aged at 350° and 500° C. As in earlier studies on Cu-Be and Cu-Ag, the lattice constant, a_0, shows no change during an incubation period in which the hardness is increasing, then as a_0 changes and the line is widened the hardness increases more gradually. Finally a visible precipitate appears as dark areas on grain boundaries, the lines become sharp again, and hardness decreases. GD (10)

Etching Characteristics of Aluminum-copper Alloys and the Influence of Additions on their Hardening Properties (Ätzerscheinungen an Aluminium-Kupferlegierungen und Einfluss von Beimengungen auf ihren Aushärtungsverlauf) H. LAY (Kaiser-Wilhelm Inst. Metallforsch.) *Z. Metallkunde,* Vol. 28, Dec. 1936, pp. 376-380. Original research. By continued etching of Al-4.2% Cu alloys, aged at 130° C., it was possible to develop excessive darkening at grain boundaries, which is interpreted as comparable to the heterogeneous grain boundary precipitation observed previously in Cu-Ag alloys. This explains the susceptibility of duralumin treated in this way to intergranular corosion. The room temperature hardening of Mg-free Al-Cu alloys is greater and more rapid than with additions of Mg, Fe, and other technical impurities. At 150° the hardening rates of all alloys were essentially the same, although the differences in maximum hardness persisted. GD (10)

The Precipitation Process in Copper-beryllium Alloys (Ueber den Ausscheidungsverlauf bei Kupfer-Berylliumlegierungen) H. BUMM (Kaiser-Wilhelm Inst. Metallforsch., Stuttgart) *Z. Metallkunde,* Vol. 29, Jan. 1937, pp. 30-32. Original research. The precipitation processes in alloys of Cu with 2.2% Be are of two types, similar to Cu-Ag alloys. One begins at the grain boundaries and progresses autocatalytically with the formation of zones that etch dark. The other begins within the grain, proceeds with constant velocity, and is not visible microscopically. Both are accompanied by changes of the lattice parameter which show that the latter type has a typical incubation period. This is attributed to the formation of an intermediate complex. GD (10)

The Rates of Crystal Growth and the Crystallite Numbers of Lead and Its Alloys with Tellurium, Lithium, and Magnesium (Kristallisationsgeschwindigkeit und Kristallitenzahl von Blei bei geringen Zusatzen von Tellur, Lithium und Magnesium) E. JENCKEL & C. THIERER (Kaiser Wilhelm Inst. Physik. Chem. u. Elektrochem.) *Z. Metallkunde,* Vol. 29, Jan. 1937, pp. 21-24. Original research. The temperature dependence of the rate of crystal growth of Pb and its alloys with up to 0.2 atomic % Te, 3% Li, and 0.8% Mg was determined by inoculating super-cooled melts. The number of crystallites formed during complete solidification with different amounts of undercooling was found for the same materials. The growth curves were displaced to lower temperatures in proportion to the lowering of the melting point of Pb by the addition element. The crystallite numbers for a given temperature increased to a maximum with addition of alloying element, corresponding roughly to the solid solubility of this element. GD (10)

The Structure of Braggite and Palladium Sulphide. T. F. GASKELL (Univ. Cambridge) *Z. Krist.,* Vol. 96, Mar. 1937, pp. 203-217. In English. Original research, Pd sulphide is tetragonal, space group $P\ 4_2/m$; $a = 6.43$ A.U., $c = 66.3$ A.U., 8 molecules in the unit cell. The structure was determined by direct Patterson and Fourier analysis on visually estimated reflection intensities. The arrangement of the Pd atoms closely resembles the β-W structure. The sulphur atoms lie close to the corners of a cube of half the linear dimensions of the unit cell. EF (10)

Precipitation Hardening in the Copper-indium System and its Modification by Nickel and Cadmium (Die Ausscheidungshärtung (Vergütung) im System Kupfer-Indium und ihre Beeinflussung durch Nickel und Cadmium) FRIEDRICH WEIBKE & ILSE PLEGER (Hannover Tech. Hochschule) *Z. anorg. allgem. Chem.*, Vol. 231, Mar 8, 1937, pp. 197-216. Original research. Cu-rich alloys containing In were studied by hardness and X-ray methods. The solid solubility of In in Cu ranges from 19.2% at 574° C. to 7.8% at 400° C. to possibly less than 4% at 20° C. Very marked age-hardening may be produced; for example, a 12.8% In alloy quenched from 650° C. had a Brinell hardness of 77 and after annealing 101 hrs. at 300° C. the hardness rose to 285. The change in lattice parameter during aging is given for a 15.2% alloy. Similarly the Ni-rich alloys of the Ni-In system were studied for concentrations up to 20% In. Liquidus and solidus points and parameter changes in the α phase were determined. The solid solubility of In in Ni is 14.5% at 883° C., 5% at 746° C. and about 1.5% at room temperature. Age hardening proceeds more rapidly in this system (although 10% In causes about the same lattice expansion, 0.051 and 0.053 A.U. in both systems) but the hardness changes are much less marked. Finally the ternary alloys of the system Cu-Ni-In containing up to 20% In were studied. Liquidus, solidus, and solid solubility surfaces of the Cu-Ni end of the system were determined. The lattice parameters of the ternary alloys do not follow the rule of mixtures. The addition of Ni to binary Cu-In alloys seems to decrease the 400° C. solid solubility of In from 9.5% at 0% Ni to 3-4% at 40-50% Ni. Still further increase of Ni content to 65% increases the solubility to 6%. The hardening effects in the ternary alloys are small compared to those in the system Cu-In but a variety of age-hardening characteristics may be obtained. Ternary alloys of Cu-In and Cd were prepared and it was found that the solubility of In in Cu was continuously lowered by Cd and thus it is possible to replace an appreciable part of the large amount of In required for precipitation hardening, (over 10%), by Cd.
HFK (10)

The Primary Structure of Cast Iron (Das Primärgefüge des Gusseisens) R. MITSCHE. *Arch. Eisenhüttenw.*, Vol. 10, Dec. 1936, pp. 263-266.The primary structure was studied by means of Oberhoffer's Cu-bearing reagent. White cast Fe shows a dendritic structure, whereas gray Fe shows a dendritic as well as globular structure. Overheating gray Fe favors the formation of a dendritic primary structure. The primary structure as related to the formation of graphite.
SE (10)

The Basic Forms for Ternary Diagrams with Components: Iron, Carbon, and an Arbitrary Third Element (Die Grundformen ternären Zustandsdiagramme mit den Komponenten: Eisen, Kohlenstoff, und einem beliebigen dritten Element) HANS EGGERS (Kaiser-Wilhelm Inst. Eisenforsch.) *Z. anorg. allgem. Chem.*, Vol. 231, Mar. 8, 1937, p. 34-53. The equilibrium diagrams of simply alloyed carbon steels may be classified in 4 groups, depending on the basic nature of the binary system Fe-X. To avoid excessive complication the author makes the limiting assumptions: (1) Each 3-phase region has only one range of equilibrium in the diagram. (2) The added element X, at the very most, forms a carbide which may react with the γ-phase. (3) No new compounds arise within the ternary diagram, i.e. ternary compounds are excluded. (4) A quasi-binary system exists between X or its carbide and Fe_3C. The four types of ternary diagrams resulting are: I. Diagrams with an open γ-field in the system Fe-X. II. Diagrams with closed γ-fields in the border system Fe-X and complete miscibility of X and the α-phase. III. Diagrams with closed γ-fields in the border system Fe-X and a miscibility gap between the α and the X-phases. IV. Diagrams with an expanded or contracted γ-field in the border system Fe-X. By means of 18 diagrams the author investigates all of these possibilities and shows directly the whole series of transformations taking place in all stages of the solidification process. He draws 2 general conclusions: (1) Without an increase in the number of phases the number of 4-phase planes increases in the same degree as phases abstain from reaction with γ plus liquid. (2) All 4-phase reactions in the solid state can only be peritectic and only the equilibrium $\alpha + \gamma + Fe_3C + XC$ phase may also be eutectic. Only those equilibria of melts and solid phases were considered that were of consequence in technical operations. Classification of ternary systems already established experimentally will appear in a later work.
HFK (10)

Recrystallization of Al-Mg Alloys (Sur la Recristallisation d'Alliages Aluminium-Magnésium) R. MICHAUD & E. SEGOL. Compt. Rend., Vol. 204, Mar. 22, 1937, pp. 980-983. Original research. Samples of Al-Mg with 2.13-12.7% Mg and total impurities less than 0.07% were annealed 4 hrs. at 425° C., oil quenched, and subsequently cold worked. X-ray examination showed that precipitation of the β phase from the quenched samples has a retarding effect upon recrystallization and grain growth.
FHC (10)

11. PROPERTIES OF METALS AND ALLOYS

Practical Importance of the Damping Capacity of Metals. *Foundry Trade J.*, Vol. 55, Oct. 8, 1936, p. 270. **Damping Properties of Materials; Surface Cold-working; Resonance Vibration-dampers for Crankshafts (Dämpfungsfähigkeit der Werkstoffe; Oberflächendrücken; Resonanz-Schwingungsdämpfer für Kurbelwellen)** O. FÖPPL. *Mitt. Wöhler Inst.*, No. 30, 1937, 58 pp. See *Metals and Alloys*, Vol. 8, June 1937, p. MA 374R/3.
HWG + AIK (11)

11a. Non-Ferrous

A. J. PHILLIPS, SECTION EDITOR

Investigation on the Magnetic Induction of Supra-conductors (Versuche zur Aufklärung der magnetischen Induktion in Supraleitern) J. STARK & K. STEINER (Phys. Tech. Reichsanstalt) *Physik. Z.*, Vol. 38, Apr. 15, 1937, pp. 277-283. Original research. Induction tests on Sn (cast, annealed and single crystals) and on a Sn-Cd alloy.
EF (11a)

Fabrication and Heat Treatment of Beryllium Copper. *Ind. Heating*, Vol. 4, Feb. 1937, pp. 112-116; Mar. 1937, pp. 206-208; Apr. 1937, pp. 281-282. An exhaustive description of composition, manufacture, treatment and properties of Be-Cu. With less than 1% Be the alloy does not respond to heat treatment; between 1.0 and 1.6% the alloy responds slightly while with 1.6 to 2.75% Be the alloy readily responds to heat treatment. The usual (Anaconda) Be-Cu contains 2.0-2.25% Be, 0.25-0.50% Ni, and less than 0.10% Fe. The good mechanical properties are obtained by precipitation hardening which produces tensile strengths greater than 200,000 $lb./in.^2$, a Rockwell hardness of C-41 or Brinell of 360 or more, a fatigue limit of over 40,000 $lb./in.^2$ These properties remain stable at ordinary temperatures. Manufacturing processes are described in detail and curves of physical and mechanical behavior given.
Ha (11a)

Influence of Lead on the Properties of Copper-berrylium Alloys. YU. A. AMSTERDAMSKI. *Metallurg*, Vol. 11, Dec. 1936, pp. 111-115. In Russian. A series of alloys containing 98% Cu and 2% Be were prepared to which 0.03-1.0% Pb was added. Lead is practically insoluble in solid state, and greatly reduces workability at elevated temperatures. With more than 0.05% Pb the alloys are unworkable. Practically no influence is exerted, however, on tensile properties or hardness characteristics. (11a)

Influence of the Original Grain Size on the Properties of Sintered Metal. N. A. AGARKOVA & A. M. KOROLKOV. *Metallurg*, Vol. 11, Dec. 1936, pp. 116-119. In Russian. Mo particles ranging from 0.77 to 2.1 microns were sintered under identical conditions. Examined under the microscope they showed that smaller grain size induces larger grains after sintering. The same result can be obtained by grinding particles having the same size for a longer time. Sintered Mo having larger grain size has greater specific gravity and hardness and lower electrical conductivity.
(11a)

Surface Tension of Molten Metals. A. P. SMIRYAGIN. *Tsvetnye Metal.*, No. 8, Sept. 1935, pp. 102-110. The author reviews briefly the theory of surface tension of molten metals and gives results of surface tension measurements of molten alloys of Pb with Na, Sb, Ca, Mg, Cd, Sn, Bi, Hg, Zn and Cu. The purpose of the investigation was to develop an As-free Pb alloy suitable for production of shot. Alloys of Pb with Na or Na and Sb were found to be most promising. Alloy containing 0.5 to 1.0% Sb and 0.02 to 0.04% Na is recommended as best for size 7 and 8 shot, and 1 to 1.5% Sb and 0.02 to 0.04% Na for sizes 3, 4, 5, and 6. 41 references.
BND (11a)

Note on the Influence of Small Amounts of Titanium on the Mechanical Properties of Some Aluminium Casting Alloys. T. H. SCHOFIELD & C. E. PHILLIPS (Nat. Physical Lab.). *J. Inst. Metals*, Vol. 60, Advance Copy No. 765, 5 pp. Original research. Sand-cast and chilled-cast bars of several commercial Al alloys were treated with $TiCl_4$ to give Ti contents up to 0.1%. Mechanical tests of the bars indicated that up to 0.1% Ti had but a small effect on mechanical properties.
JLG (11a)

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11b. Ferrous

V. V. KENDALL, SECTION EDITOR

Identification of Non-metallic Inclusions in Steel. R. GRAHAM & R. HAY. *J. Roy. Tech. Coll., Glasgow,* Vol. 4, Part I, Jan. 1937, pp. 77-84. IBID. *Iron & Coal Trades Rev.,* Vol. 134, Apr. 9, 1937, p. 661. Original research. Non-metallic inclusions which occur in steel can be identified approximately by microscopic examination with the assistance of polarized light and dark field illumination. The presence of substances in solution often considerably alters the appearance of inclusions, and so renders their identification difficult or liable to error, and for this reason the possibility of using micro-chemical methods was investigated with the result that a technique for the identification of Fe, Si, Al, and Ca in inclusions has been developed. JWD + Ha (11b)

Molybdenum in Modern Oil-Drilling and Production Equipment. JOHN E. WILSON. *Preprint, Am. Petroleum Inst.,* Nov. 1936, 18 pp. Review. The trend to deeper oil wells has necessitated an increase in the physical properties af oil-drilling and production equipment. The physical properties of Mo alloy steels and cast irons are given with illustrations of microstructure. Mo additions to steel produce a marked increase in the ultimate and yield strengths without a corresponding loss in elongation and reduction of area. The effect of Mo in Cr, Ni and Cr-Ni steels is to accentuate the properties of those steels. The Cr-Mo steels are noteworthy for their high reduction-of-area and impact properties, in conjunction with their high tensile properties and ease of machining. The addition of Mo to Ni and Cr-Ni steels, as in the case of C steels, increases the reduction-of-area, elongation and impact properties. Simillar effects are produced with the cast alloy irons. VVK (11b)

Nickel-alloy Steels in Drilling Equipment. ALBERT G. ZIMA (Intern. Nickel Co.) *Proc. Am. Petroleum Inst.,* Vol. 17, sec. M (IV), 1936, p. 11. Concise descriptions, with tables of physical properties, are given of the alloy steels used in the manufacture of drilling equipment such as bits, drill collars, kellys, tool joints, chain, etc. and such other items as control fittings and sucker rods. VVK (11b)

Cracks in Stellite Coated Valve Seats and the Average Thermal Expansion Coefficient of Two Stellites (Über Risse in stellitierten Ventilsitzflächen und den mittleren thermischen Ausdehnungskoeffizienten von zwei Stelliten) H. CORNELIUS & F. BOLLENRATH. *Z. Metallkunde,* Vol. 28, Dec. 1936, pp. 383-385. Original research. Cracks in stellite coated valve seats for aircraft are attributed to differences in thermal expansion between the stellite and valve steel (0.4% C, 13% Cr, 2.5% W, 13% Ni). During the first heating of cast stellite marked decrease in expansion and increase in magnetic susceptibility occurred at about 830° C.; the microscope indicated that this was due to the separation of carbides. GD (11b)

Recovery of Steels from Acid Brittleness. S. COPPICK (McGill University). *Wire & Wire Prod.,* Vol. 12, Feb. 1937, pp. 67-71, 108; Mar. 1937, pp. 123-128, 160. Exhaustive original research into the phenomenon of brittleness induced in steels by pickling, and methods to obviate this effect and recover original properties. For a given steel, the rate of recovery is a linear function (derived) of temperature. The critical energy loss can be expressed by log $E_e = c - gT$; c and g are constants. Generally, low C steels will sufficiently recover from embrittlement on baking at 100° C. Mn content has no perceptible effect on recovery, nor do small amounts of cold work. The higher the C content of a steel the less it recovers in baking; high C steels can not efficiently be baked at 100° C. The rate of recovery seems to vary largely with the diameter. The longer the time of pickling, the more the embrittlement induced; the steel follows, however, the same path of recovery except that it begins from a lower value of toughness. 16 references. Ha (11b)

Structure and Properties of Chromium-manganese Steels of up to 1% C, 15% Mn, and 30% Cr (Gefüge und Eigenschaften von Chrom-Mangan-Stählen mit Gehalten bis 1% C, 15% Mn und 30% Cr) F. BRÜHL. *Arch. Eisenhüttenw.,* Vol. 10, Dec. 1936, pp. 243-255. About 5% Mn lowered the critical cooling rate of the alloys appreciably and tended to stabilize the austenite. Alloys with over 10% Mn in which austenite was formed on quenching showed an $(\alpha + \gamma)$ conglomerate, the α breaking down to FeCr + austenite on heating to about 700° C. The formation of FeCr was aided by increased Mn, hindered by increased C. Hardnesses of about 350 Brinell were obtained on quenching from 1200° C. and tempering at 600° C. The alloys were weldable. The corrosion resistance was not so good as similar Cr-Ni stainless steels, nor was the oxidation and heat resistance. SE (11b)

The Economic Life of Sucker Rods. EMORY KEMLER (Gulf Oil Corp. of Pa.). *Proc. Am. Petroleum Inst.*, Vol. 17, Sec. M (IV), 1936, p. 9; *Oil & Gas J.*, Vol. 34, May 14, 1936, pp. 217, 220-221. Evaluation of sucker-rod service and the determination of the economic life of any particular string of rods require a knowledge of the behavior of the rods under operating conditions. Preliminary study of field records of test strings of sucker rods indicated that the number of failures could be expressed in the form of $N = b\,T^m$ where N represents the number of the failure; T, the time at which the nth. failure occurred and b and m constants which determines the character of the curve showing the relation between the number of the failure and the time at which it occurred. Plotted on log-log paper, the curve becomes a straight line. With the collection of more detailed information, it should be possible to determine the effects of speed, stroke, corrosion, loads, etc., on rod failures. VVK (11b)

Diffusion of Cathodically Generated Hydrogen and Deuterium through Iron (Die Diffusion des kathodisch entwickelten Wasserstoffes und Deuteriums durch Eisen) P. C. BLOKKER. *Rec. Trav. Chim.*, Vol. 55, Nov. 15, 1936, pp. 979-988. In German. Original research. The diffusion of cathodically evolved H and deuterium through Fe in the presence of As_2O_3 and $HgCl_2$ as poison was investigated. The connection between the over-voltages for H and deuterium and the differences between the diffusion rates of both gases could not be interpreted. See *Metals and Alloys*, Vol. 3, Dec. 1932, p. MA 355R/1. EF (11b)

Cast Irons. A Review of Recent Developments. W. L. ALLEN. *Commonwealth Eng.*, Vol. 24, Sept. 1, 1936, pp. 57-62. A review stressing Australian conditions under the following headings: Australian cast-irons, modern trends in the use of cast Fe, classification of cast irons, heat-treated cast irons, high-allow cast irons for special purposes, cast irons with higher Ni contents, high-Si-irons for resistance to corrosion by mineral acids. EF (11b)

VIT-iron and Peculiarities of Its Manufacture. P. S. ROGOZIN. *Metallurg*, Vol. 11, Dec. 1936, pp. 15-25. In Russian. Six heats of commercially pure Fe made in 5 ton open-hearth furnace are described in detail. No oreing was required to bring C to 0.02%. Properties of the metal of domestic production are given. (11b)

The Influence of Wall Thickness Sensitivity for the Mechanical Properties of Gray Iron (Der Einfluss der Wandstärkenempfindlichkeit auf die mechanischen Eigenschaften von Grauguss) H. JUNGBLUTH. *Giesserei*, Vol. 24, Jan. 29, 1937, pp. 49-59. See *Metals and Alloys*, Vol. 8, Jan. 1937, p. MA 39L/6. Ha (11b)

Internal Stresses and Repeated Bend Properties of Nitrided Steel (Eigenspannungen und Biegewechselfestigkeit verstickter Stahlproben) R. MAILÄNDER. *Arch. Eisenhüttenw.*, Vol. 10, Dec. 1936, pp. 257-261. Original research. The samples used were 0.30% C, 1.3% Cr, 1.0% Al, 1.8% Ni, 0.25% Mo, nitrided at 500° C. for 96 hrs. to a depth of 0.65 mm. The depth was very uniform and the increased dimensions could be allowed for, eliminating machining of the finished specimens. The presence of internal stresses was attributed to the change in volume in nitriding. The endurance limit on repeated bending of the nitrided pieces was 90,000 lbs./in.^{2} and the tensile strength of the specimens was between 150,000 and 200,000 lbs./in.^{2} SE (11b)

Two Examples of X-ray Application to Metallurgy (Deux Exemples d'Application des Rayons X à la Métallurgie) R. MICHAUD. *Rev. Mét.*, Vol. 34, Feb. 1937, pp. 195-203. The relation between watt loss in Si transformer sheets and the regularity of their Laue pattern proposed by G. L. Clark was checked by examining sheets of practically the same composition but different magnetic characteristics with X-rays. No relation between radiograms and the electrical properties was found. The method was successfully used for determination of recrystallization temperature in hot rolled Al sheets. JDG (11b)

Cast Iron with Copper—Its Characteristics and Uses (Le glise al rame-loro caratteristiche e loro impieghi) M. PREVER. *Ind. Meccanica*, Vol. 19, Mar. 1937, pp. 147-153. General review of published data for alloyed cast Fe, especially with Cu. Curves of mechanical properties are given. Ha (11b)

Corrosion-resistant Copper Steels, Their Defects and Advantages (Gli acciai al rame, resistente a corrosione, loro difetti e loro pregi) M. PREVER. *Ind. Meccanica*, Vol. 19, Feb. 1937, pp. 75-80. A review of literature on the manufacture and properties of steel to which Cu has been added to make it corrosion-resistant. The value of Cu seems to the author still to be debatable. 10 references. Ha (11b)

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12. EFFECT OF TEMPERATURE ON METALS AND ALLOYS

The abstracts in this section are prepared in co-operation with the Joint High Temperature Committee of the A.S.M.E. and the A.S.T.M. The purpose of this cooperation is to make readily available complete references to the literature of this subject. The Committee does not necessarily subscribe to the statements of either the author or the abstractor

H. C. CROSS, SECTION EDITOR

Repeated Tensile Tests of Steel at Temperatures up to 600° C. (Zugwechselversuche mit Stahl bei Temperaturen bis 600°) M. HEMPEL & H. E. TILLMANNS. *Arch. Eisenhüttenw.,* Vol. 10, Mar. 1937, pp. 395-403. Original research. The Loesen pulsator machine was used, the specimens being immersed in oil for temperatures up to 200° C., in molten $KNO_3 + NaNO_3$ from 300-400° C., and in molten lead from 500-600° C. Values are given for the endurance limit at these temperatures; the steels used showed a maximum endurance limit in the blue heat region of 300° C. Time-elongation curves are also shown. The rate of creep for rapidly repeated tensile loading of up to 500 cycles/min. was generally about the same as for static loading for corresponding temperatures, loads, and times. SE (12)

Developments in Steam Turbines in 1936. E. R. KAUFFMAN. *Blast Furnace & Steel Plant,* Vol. 25, Jan. 1937, pp. 112-114, 129. Review. Cylinders for high-temperature turbines now under construction are made of C-Mo steel. MS (12)

Creep and Growth of Cast-irons. H. J. TAPSELL & M. L. BECKER. *Engineering,* Vol. 142, July 10, 1936, pp. 50-52; July 17, pp. 76-79. See *Metals and Alloys,* Vol. 7, Oct. 1936, p. MA 507 R/3. VSP (12)

Modern High-pressure Boilers and Their Design Problems. A. L. MELLANBY. *Blast Furnace Steel Plant,* Vol. 24, July 1936, pp. 607-609, 615; Aug. 1936, pp. 696-697, 704, 713. See *Metals and Alloys,* Vol. 8, Jan. 1937, p. MA 43R/9. MS (12)

Note on the Chemical Intercrystalline Fracture of Riveted Joints in Boilers. S. F. DOREY. *Engineer,* Vol. 163, Apr. 2, 1937, pp. 385, 390; *Engineering,* Vol. 143, Apr. 2, 1937, pp. 382-383, 392-393. Includes discussion. See *Metals and Alloys,* Vol. 8, July 1937, p. MA 439L/6. LFM (12)

Transformations Produced in Certain Metals on Heating in Vacuo, Inert Gases or in Air (Transformations Produites dans certains Métaux par le Chauffage dans le Vide, les Gaz Inertes ou l'Air) J. J. TRILLAT. *Métaux et Corrosion,* Vol. 12, Jan. 1937, pp. 6-8. Original research. The diffraction of electrons by metallic sheets or metallic surfaces provides a very sensitive method for revealing surface modifications due to oxidation, corrosion, adsorption of gas, polishing, etc. 50 μμ sheets were subjected to 40-50 kilovolts electron stream and the diffraction diagrams observed on fluorescent screen (ZnS). On heating Au foil in air, a certain type of diagram is observed, which is replaced, on heating for 2 hrs. at 500° C. in vacuo or in inert gases (nitrogen or argon) by a new diffraction diagram having a well defined hexagonal symmetry. This phenomenon is attributed to the superficial movement of the atoms and to the fluidity of the metal, caused by local fusion and the resulting formation of spherolites. The atoms were grouped in hexagons of 5.20 A.U. sides and with the c axis perpendicular to the foil. Similar results were obtained with Ag. By the same method, it was found that Al, Cu, Fe form stable oxides, which are not reversible on heating in vacuo. GTM (12)

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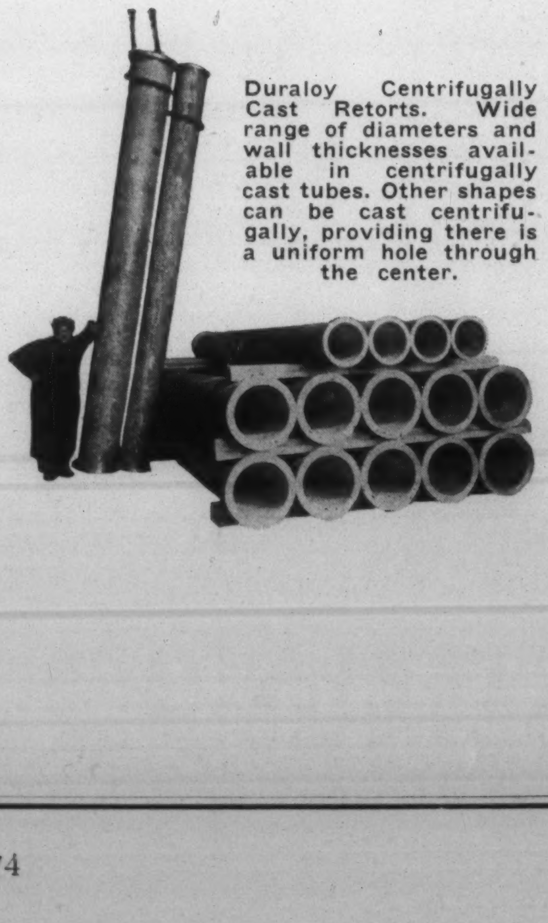

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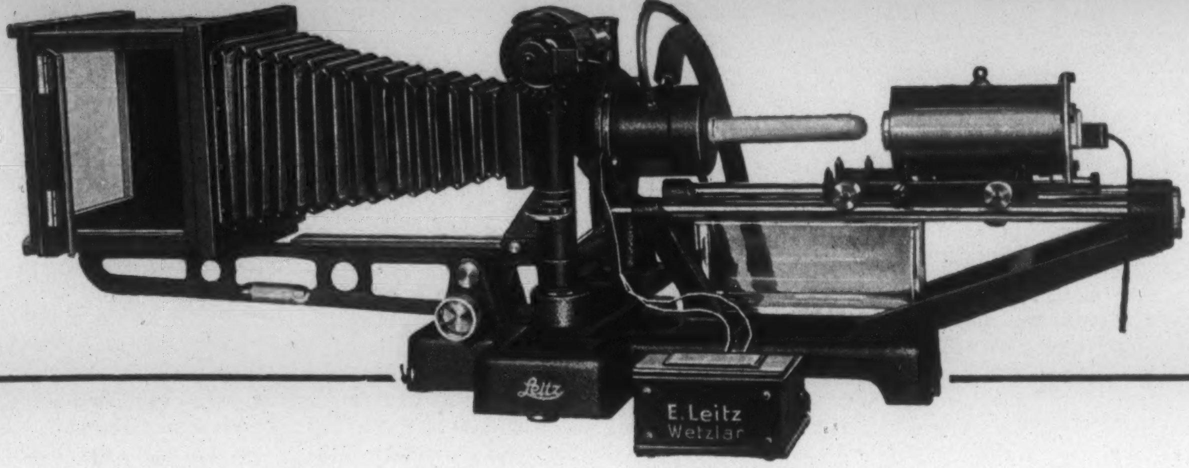

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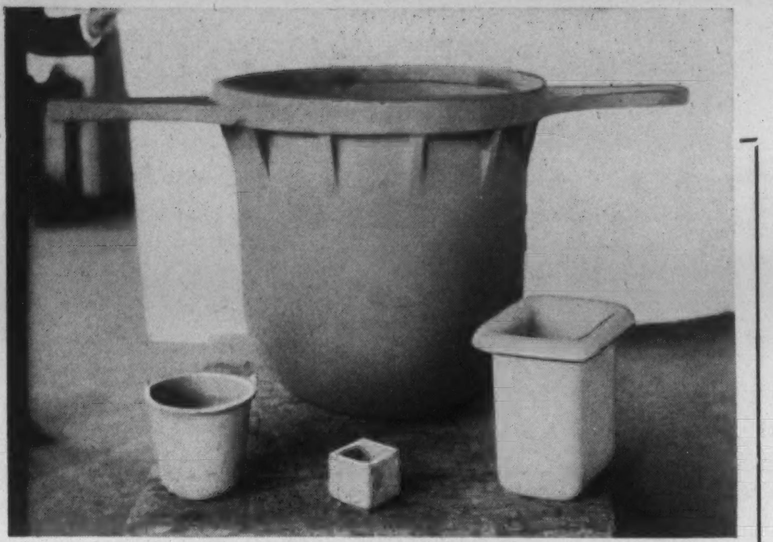
Creep as Occurring in Different Steels under Service Conditions. W. H. Hatfield. *Iron & Coal Trades Rev.,* Vol. 134, Apr. 23, 1937, pp. 735-736. Survey. Data were collected for creep strength of different steels and divided in two classes: (1) Steels used in the range of 400°-550° C. which contained C, Si, Mn, Ni, Cr, with or without Mo, Ti and Al. (2) Steels used from 550°-1000° C. which were composed of C, Si, Mn, Ni, Cr, W, with or without Ti and Al. For each type, heat treatment, ultimate tensile strength, time yield (i.e. the stress which, during the second and third 24 hrs., does not produce creep in excess of the rate of one millionth in. per in. per hr.) and safe stress are given in tables. The best steel, with an ultimate tensile strength of 6.1 ton/in.^{2} at 1000° C. contained 0.28% C, 1.60% Si, 0.55% Mn, 11.5% Ni, 23% Cr, 3% W, and was air-cooled from 1050° C. The data available for steels in the first class are considered satisfactory for design. More experiments are required for steels of the second class. Ha (12)

Physical Properties of Steel in the Temperature Range of Blue Heat. Irregularities in the Course of the Load Elongation Curve (Festigkeitseigenschaften von Stahl im Temperaturgebiet der Blauwärme. Unregelmässigkeiten im Verlauf der Spannungs-Dehnungs Schaulinien) W. Enders. *Arch. Wärmewirt.,* Vol. 18, Mar. 1937, pp. 83-85. Original research. Sensitive tensile tests on carbon steels at temperatures in the blue brittle range (100°-300° C.) showed a number of irregularities caused by sudden increases in elongation with decreased load. The peak of the temperature-number of irregularities curve for different steels occurs at different temperatures which depend on the gas content of the steel. The higher the O and N content, the lower is this temperature and the greater the increase in tensile strength at this temperature over room temperature values. Long annealing at 680° C. followed by slow cooling did not affect the tensile tests of the steels with high gas content but caused a marked decrease in their room temperature impact values. This treatment greatly decreased the tensile irregularities of the steels with low gas content but had no effect on their room temperature impact values. Small differences in chemical composition cause great differences in physical properties between 100° and 300° C. The manner of melting is very important and should be carefully controlled for articles to be used at this temperature. See also *Metals and Alloys,* Vol. 6, Dec. 1935, p. MA 510L/7. JZB (12)

A Study of Oxide Films on Metal Surface with Cathode Ray Diffraction. II. Iron, Chromium, Nickel and Their Alloys. Shizuo Miyake. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 31, Mar. 1937, pp. 161-173. In English. Continuing previous research (see *Metals and Alloys,* Vol. 7, Mar. 1936, p. MA 151L/6) specimens were polished, heated in either an electric furnace or flame of a gas burner and the resulting oxides studied with cathode rays. An α-Fe_2O_3 film was observed on Fe after heating above 250° C., but at lower temperatures, Fe_3O_4 is probably formed. Fe_3O_4 was also observed in the layer underlying the outermost α-Fe_2O_3 film. NiO and Cr_2O_3 were found on Ni and Cr respectively. On surfaces of Fe-Al alloys (2-15% Al) and 97/3 Fe-Ni and 36/64 Fe-Ni alloys no oxides other than α-Fe_2O_3 were detected. On stainless steels (17 Cr, 83 Fe and 18/8) $FeCr_2O_4$ co-existing with Cr_2O_3 or a solid solution of CrO_2O_3-Fe_2O_3 were formed. The diffraction pattern on 80 Ni-20 Cr specimens heated to 700-900° C. for one hr. is interpreted as cubic crystals of $NiCr_2O_4$ with a = 8.32 A.U. [Smithells, Williams & Avery, *Journ. Inst. Met.,* Vol. 40, 1928, p. 269, found by X-rays that 3 oxides form on 80/20 Ni-Cr, namely Cr_2O_3, NiO and $NiCr_2O_4$, the proportion of the latter being negligibly small—E. F.] On 70/30, 40/60 and 7/93 Ni-Cu alloys there was found only a CuO film but existence of a NiO film beneath the uppermost layer is suggested. 6 photographs of diffraction patterns are reproduced. EF (12)

Design Aspect of Creep. R. W. Bailey. *J. Applied Mechanics,* Vol. 3, Mar. 1936, pp. A1-A6. An attempt is made to show how the property of creep of a metal can be considered in practical design just as is elasticity. A relation $t = A \times e^{(33,000/T)}$ was established which gives the time of heating at 650° C. to produce an effect equivalent to 100,000 hrs. at temperatures of 450°, 475° and 500° C.; t is time in hrs., T is the absolute temperature, °C., A a constant depending on the composition and previous history of the steel. The method is explained using Mo steel as an example. It is concluded that when an alloying element is used to increase creep resistance, i.e. the resistance of the grains to deformation, earlier failure by intercrystalline separation takes place if the alloying element does not at the same time improve the endurance of the grain boundaries to the same extent as the grains. 7 references. See also *Metals and Alloys,* Vol. 7, Nov. 1936, p. MA 548R/3. Ha (12)



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13. CORROSION AND WEAR

V. V. KENDALL, SECTION EDITOR

Singing Propellors. HARRY HUNTER. *N. E. Coast Inst. Engrs. Shipbldrs.,* Advance Copy Feb. 1937 meeting, 18 pp. text, 16 pp. diagrams. *Engineer,* Vol. 163, Feb. 26, 1937,, pp. 258-280, Mar. 5, 1937, pp. 285-288. See also editorial comment in *Engineering,* Vol. 143, Mar. 12, 1937, pp. 291-292. An account is given of various occurrences of noisy ship propellers and methods used to investigate source of the disturbance which in several cases had sufficient power to set ship frame in vibration. One company considered the cause of unsatisfactory (noisy) propellers to be due to differences in (1) material, (2) method of manufacture, (3) heat treatment after casting (annealing), (4) blade section or formation, (5) climatic conditions. The author considers relationship to exist between noisy propeller and pitting of bronze propellers (cavitation) and measures to prevent noise should consider geometrical accuracy of finished propeller of closer order than usual commercial limits, modulus of elasticity and elastic hysteresis of the propeller metal may determine responsiveness of propellor to eddy current incitation; damping effect may be important in preventing noise. Several eases of pitting of propellor blades are illustrated. WB + LFM (13)

The Application and Economics of Electrical Protection of Pipe Lines. STARR THAYER. *Proc. Am. Petroleum Inst.,* Vol. 17 (IV), Nov. 1936, pp. 33-36. A description of the practical developments in cathodic protection. The United Gas Public Service Co., Houston, Tex., is at present using 3 types of equipment: the Rectox unit which is a unit that transforms alternating current, such as is ordinarily available, from the power-line voltage to the lower voltage required, and then rectifies it to direct current; the wind mill generator unit which will develop from 70 to 100 amps. with a 12-mile wind; and a gas engine unit. They have always found that, barring pipe of short length or small diameter, it is more economical to protect a line electrically than to recondition it, regardless of the soil and coating conditions. VVK (13)

Testing Metals for Severe Service. An Extended Abstract. H. W. GILLETT (Battelle Mem. Inst.). *Metals and Alloys,* Vol. 8, Apr. 1937, pp. 101-105. Correlates the present knowledge of wear and corrosion testing and the principles applicable to such tests. WLC (13)

Protection of Distribution Systems by Correction of Water Quality. H. S. HUTTON (Wallace-Tiernan Co.). *J. Am. Water Works Assoc.,* Vol. 29, Feb. 1937, pp. 234-239. A survey of municipal water supplies mostly along the Atlantic Seaboard in which corrective treatment is applied for the prevention of corrosion and red water revealed some 300 plants using lime entirely or intermittently for pH correction, about 50 using soda ash and a half dozen using caustic soda. It is pointed out that the principal trouble is from tuberculation due to bacteria (crenothrix and other allied organisms) and that the tuberculation is far in excess of the amount of Fe actually removed from the pipe wall. The chloramine (chlorine and ammonia) process has been used with considerable success for this condition. VVK (13)

Statistical Correlation and Metallurgical Problems. T. P. HOAR. *Metallurgist,* Suppl. *Engineer,* June 1936, pp. 134-137. The value of the correlation coefficient and of data from small number of specimens in corrosion and metallurgical work is illustrated by a number of examples. VVK (13)

Gasolene-tank Corrosion in Motor Boats. A. E. PEU, JR. *Proc. 6th Midyear Meeting Am. Petroleum Inst.,* Section III, 1936, pp. 20-21. Leaks in gasolene storage on motor boats due to corrosion are extremely hazardous. Corrosion in a large number of tanks was found to be principally confined to the vapor space and the bottom, chiefly due to moisture. Although galvanized Fe is used to a large extent, deterioration soon develops either through imperfections in the Zn coating or at the soldered joints. Tinned Cu tanks are similarly affected. A number of Cu alloys are available which possess high tensile and marked resistance to corrosion. These, moreover, possess satisfactory weldability properties by either the arc or the torch method. Si bronze is an example, two representative grades of which are described. Gasolene storage tanks made of such silicon bronzes, although costing more initially than galvanized Fe tanks, eliminate fire and explosion hazards and costly repaair. Their use is justified over long periods. AAA (13)

Passivity of Iron and Steel in Nitric Acid Solution. Report X. YOICHI YAMAMOTO. *Bull. Inst. Phys. Chem. Research, Tokyo,* Vol. 15, Sept. 1936, pp. 981-1054. In Japanese. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 30, Sept. 1936, Abstracts pp 53-55. In English. Continuing previous research (*Metals and Alloys,* Vol. 8, Jan. 1937, p. MA 41R/5) the potential difference between active and passive Fe in stationary conc. HNO_3 was found to be 0.74-0.76 volt. Stirring increases this value. The potential difference corresponds to $Fe^{+++} + e \rightleftarrows Fe^{++} + 0.748$ Volt. Activation of the passive Fe in HNO_3 solution by heating above 70° C. occurs with the change of the ferric oxide on the surface to the ferrous oxide. In more concentrated solution the activation does not occur, and Fe is dissolved in the ferric state. The ability of concentrated HNO_3 to make Fe passive is decreased by urea additions, resulting in a depression of the electrode potential of Fe and a removal of nitrous acid as the O carrier. Fe becomes passive very easily in HNO_3 containing $AgNO_3$, which decomposes and accelerates the Fe oxidation, according to the reaction $2\ AgNO_3 + 4\ HNO_3 = 2\ Ag(NO_3)_2 + 2\ HNO_2 + H_2O + O$. The electrode potential becomes positive. The same holds for additions of Cu nitrate although the appearance of the passivity phenomenon is not affected. It is assumed that Cu nitrate dissolves in HNO_3 without formation of nascent O. HCl additions decrease the ability of conc. HNO_3 to passivate Fe of depressed potential. Small amounts of H_2SO_4 also impede the appearance of the passivity phenomenon, by forming $Fe_2(SO_4)_3$. Additions of large quantities of H_2SO_4 to conc. HNO_3 makes the Fe insoluble in the mixture owing to a coating of insoluble $Fe_2(SO_4)_3$. The critical concentrations of H_2SO_4 and HNO_3 in the mixed acids to make Fe insoluble are experimentally determined. **Report XI.** *Bull. Inst. Phys. Chem. Research, Tokyo,* Vol. 15, Nov. 1936, pp. 1209-1215. In Japanese. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 30, Nov. 1936, Abstracts pp. 64-65. In English. The influence of stirring the solution in which the test piece is immersed on the electrolytic solution tension and on the appearance of the passivity of mild steel was investigated. The electrolytic solution tension of mild steel, i.e. the potential difference between the steel and Pt electrodes, increases on stirring the solution—particularly if it be dilute. The appearance of passivity was greatly checked by stirring, owing to removal of corrosion products on the surface that aids passivation. At high HNO_3 concentrations, stirring did not interfere with passivity. The interrelation between degree of stirring, HNO_3 concentration and appearance of the passivity phenomenon was quantitatively established. **Report XII.** *Bull. Inst. Phys. Chem. Research, Tokyo,* Vol. 15, Nov. 1936, pp. 1216-1229. In Japanese. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 30, Nov. 1936, Abstracts pp. 65-66. In English. When HNO_3 is electrolyzed, O_2 is evolved at the anode and H_2 is generated at the cathode. HNO_3 solutions of various concentrations were electrolyzed using passive Fe anodes and cathodes. H_2 gas at the cathode was consumed to reduce the HNO_3 and was not observed to evolve. With increasing voltages, the decomposition of HNO_3 and the visible amounts of H_2 at the cathode increased. Thus the surface of the passive Fe cathode became reduced and activation took place. The voltage necessary to convert passive Fe cathodes into active is raised by increasing HNO_3 concentrations. The voltage required to make active Fe anodes passive in diluted HNO_3 was also experimentally determined. **Report XIII.** *Bull. Inst. Phys. Chem. Research, Tokyo,* Vol. 15, Dec. 1936, pp. 1257-1284. In Japanese. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 30, Dec. 1936, Abstracts pp. 69-70. In English. Further oxidation of ferrous oxide to ferric oxide is responsible for the passivity phenomenon of Fe in HNO_3. The decomposing HNO_3 molecule furnishes the necessary O when the solution potential of Fe exceeds the decomposition voltage of the HNO_3 solution. Additions of urea raise the decomposition voltage. Na or Ag nitrate lowers it. The relationship between the decomposition voltage and the appearance of the passivity phenomenon was established. The dissolution of the active Fe in HNO_3 occurs in the divalent state and passivity in the trivalent state. The application of a certain voltage is necessary for the decomposition of HNO_3 solution. The potential difference between Fe and HNO_3 shortly after immersion in the latter is raised with increasing HNO_3 concentrations. **Report XV.** *Bull. Inst. Phys. Chem. Research, Tokyo,* Vol. 16, Mar. 1937, pp. 152-165. In Japanese. *Sci. Papers Inst. Phys. Chem. Research, Tokyo,* Vol. 31, Mar. 1937, Abstracts, p. 19. In English. The influence of the passage of an alternating electric current on the rate of solution of the active Fe and on the preservation of the passivity of Fe in HNO_3 solution was investigated. It was found that the dissolution of 2 active Fe electrodes in HNO_3 solution was accelerated by the passage of the alternating current between them, and the passivity of the Fe in the concentrated HNO_3 solution was destroyed by an e.m.f. greater than 4 volts.

EF (13)

Corrosion Protection in Refineries. ARTHUR MARKS. *Proc. Am. Petroleum Inst.,* Vol. 17 (III), Nov. 1936, pp. 71-79. See *Metals and Alloys,* Vol. 8, Mar. 1937, p. MA 175L/1.

VVK (13)

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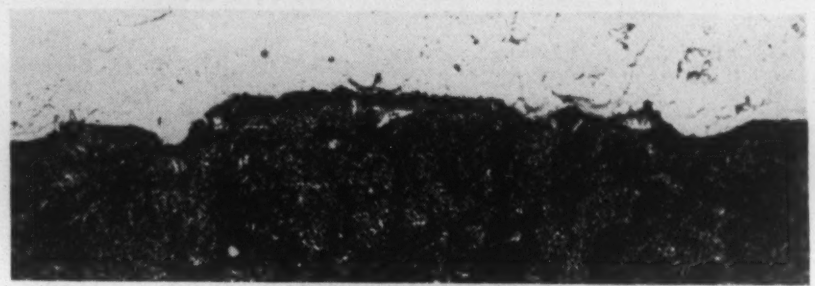

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Corrosion of Tubing in the Oil Industry. N. W. MITCHELL. *Refiner & Natural Gasoline Mfr.*, Vol. 15, Dec. 1936, pp. 559-563; *Oil & Gas J.*, Vol. 35, Oct. 29, 1936, pp. 43-44, 47. Paper before the Mfrg. Comm. of the Western Pet. Ref. Assoc., Fort Worth, Texas. About 37,500 shell-and-tube units, including condensers, reboilers, coolers and heat exchangers, are in use in the oil industry. The average tube life is about 2 yrs. Alloys used for tubing are plain C steel, stainless steel, 4-6% Cr + 0.5% Mo, plain C steel + 0.5% Mo, and Admiralty. About 50% are ferrous and 50% non-ferrous with Admiralty comprising the bulk of the non-ferrous. Condenser and heat exchanger tubes are in contact with two different corrosive conditions, corrosive water and corrosive sulphurous or acidic oil vapors. Types of corrosion discussed were galvanic, deposit attack, dezincification and stress corrosion. A two year service test is reported where the inside of the tubes were exposed to corrosive water at 150° F. and the outside to oil vapors. Corrosion was mainly from the water side and took the form of dezincification with the yellow brass alloys. Practically no corrosion was suffered by red brass, cupro-nickel alloys and arsenical high brass. The high Cu content alloys suffered corrosion of the vapor side. 98% Cu-Ni alloy failed rapidly by thinning caused by attack of the oil vapors outside the tubes. Data are also given on corrosion by S. A duplex tube, 90-10 Cu-Zn on one side and Admiralty on the other is now being tried for resistance to water and S. VVK (13)

Pipe Cleaning Yards Built to Meet Standard Specifications. L. G. E. BIGNELL (Staff). *Oil Gas J.*, Vol. 35, Apr. 1, 1937, pp. 40-41, 48. Description of the reconditioning yards and practice used in recent large scale pipe line reconditioning work. VVK (13)

A Rapid Method for Corrosion Tests (En snabbprovningsmetod vid korrosionsundersökningar) WILH. PALMAER. *Tek. Tid.*, Vol. 67, Feb. 13, 1937 (Section *Kemi*) pp. 9-12, and Mar. 13, 1937, pp. 17-22. See *Metals and Alloys*, Vol. 7, Dec. 1936, p. MA 609L/5. BHS (13)

Conditions of Mains in Typical American Cities. EDGAR K. WILSON. *J. Am. Water Works Assoc.*, Vol. 28, Sept. 1936, pp. 1304-1343. A survey of the condition of water mains in the U. S. comparing the Williams-Hazen coefficient with pipe age for various sizes. VVK (13)

Electrogalvanic Phenomena of the Oral Cavity Caused by Dissimilar Metallic Restorations. EVERETT S. LAIN & G. S. CAUGHRON. *J. Am. Dental Assoc.*, Vol. 23, Sept. 1936, pp. 1641-1652. A report on the examination of more than 1000 cases which contained dissimilar metallic restorations. The electro-positive metals give evidence of erosion, showing bright, clean surfaces, while the electronegative metals often show darkened and tarnished surfaces. The standard electromotive series is used as the basis of reactions and the current measured in microamperes. In one case Al-Au showed 110 microamperes; in a second case, different Ag fillings (amalgams) showed 10 to 40 microamperes; and in a third, gold crowns and silver fillings showed 16 to 18 microamperes. Pathological conditions developed in each of these cases; but disappeared when dissimilar metals were no longer present. OEH (13)

Induced Current Along Pipe Lines Retards Corrosion. STARR THAYER. *Oil Gas J.*, Vol. 35, Sept. 24, 1936, pp. 91, 110. For the cathodic protection of pipe lines where power is available Rectox units were designed. They consist of a completely dry, nonchemical metallic oxide rectifier. Where power is not available, the windmill generator has been utilized. A 14 ft. propeller and a 70-amp. generator mounted on a 40 ft. tower of either wood or steel is used. A gas engine generator unit has recently been developed capable of a load of 70 amps. at 6 v. Advantages and disadvantages of the three systems are given. VVK (13)

The Influence of Temperature on the Electrode Potential Concentration Curves for Binary Alloys (Der Einfluss der Temperatur auf die Spannungskonzentrations-linien binärer Legierungen) G. TAMMAN & H. WARRENTRUP. *Z. anorg. allgem. Chem.*, Vol. 230, Dec. 19, 1936, pp. 41-52. Critical review. The relation of electrode potential to alloy concentration in binary systems at room temperature is discussed for each type of equilibrium diagram. In most cases there is little or no internal diffusion in the metal at room temperature so the potential-concentration curve consists of horizontal lines with a stepwise change whenever a new phase appears or disappears, the potential becoming that of the less noble component. This behavior is illustrated by curves for alloys of the metals Cu, Ag, and Au with Cd, Sn, Zn and Pb. At temperatures where internal diffusion can replace the less noble atoms that leave the surface the potential will change with concentration in the solid solution ranges. This is illustrated by curves for the systems Cu-Zn, Cd-Ag, and Cd-Hg. Quantitative measurements of diffusion velocities cannot be derived from potential-concentration-temperature data until a way is found for determining the amounts of less noble metal passing into the electrolyte. HFK (13)

Elementary Phenomena in the Formation of Metal Oxide from Metal and Oxygen and in Kindred Reactions (Elementarvorgänge bei der Bildung von Metalloxyd aus Metall und Sauerstoff sowie bei verwandten Reaktionen) CARL WAGNER. *Angew. Chem.* Vol. 49, Oct. 10, 1936, pp. 735-740. Instructive review. 55 references. Ha (13)

Corrosion Resistance of Ancient Iron. A. W. SIMPSON & F. N. SPELLER. *Metals and Alloys*, Vol. 7, Aug. 1936, pp. 199-203. Specimens from scale armor, 17 centuries old, unearthed at Dura-Europos on the Euphrates River were examined metallographically. The structure was heterogeneous consisting of ferrite grains intermingled with a substantial amount of oxides. Structures of low C steel more or less banded were also found. Analysis was C .09%, Mn .01%, S .007%, P .114%, Si .013%, Cu nil. A 3-month corrosion test in hot, aerated Pittsburgh city water showed no difference in results between the ancient iron and wrought iron and a .14% C steel. WLC + VVK (13)

The Yearly Rust Loss of Steel in Germany (Der jährliche Rostverlust an Stahl in Deutschland) K. DAEVES & K. TRAPP. *Stahl u. Eisen*, Vol. 57, Feb. 18, 1937, pp. 169-171. The amount of rusting is calculated from the rate of rusting in industrial and rural locations of all the steel in use according to the type of use. Since for most steel applications replacement is made because of wear, etc., rather than because of rusting, the rust loss in these cases must be calculated not according to the cost of replacement but according to the scrap value of the weight of the steel lost by rusting. Thus the losses due to rusting are considerably smaller than the figures usually quoted. In Germany the actual rust losses of steel in a year amount at most to 125,000 tons or about 8 million R.M. SE (13)

Prevention of Corrosion in Chemical Plants (Corrosieverschijnseben in onze chemische Bedrijven) J. VAN AKEN. *De Ingenieur*, Vol. 51, Nov. 20, 1936, pp. Mk. 31-Mk. 34. Corrosion in steam-boiler plates was investigated with regard to quality and treatment of the feed water, and water treatment combined with careful selection of material for the boiler plates is discussed. Ha (13)

14. APPLICATION OF METALS AND ALLOYS

Resistant Metals. Economy or Cheapness? C. R. VINCENT (Alloy Fabricators, Inc.). *Ind. Eng. Chem.*, Vol. 29, Apr. 1937, pp. 389-393. Discussion of true and false economies in the design and construction, as well as up-keep of metal equipment. Many profitable considerations are here given for designer, fabricator, purchaser, and operator. The problem demands much intelligent thought and attention to every detail of construction and use of equipment. MEH (14)

Light Construction Through Shapes Suitable to the Materials (Leichtbau durch werkstoffgerechtes Gestalten) A. THUM. *Arch. Eisenbahnw.*, May-June, 1937, pp. 655-672. Instead of rolling stock being designed so there are a few points of maximum stress, it should be designed like the "one hoss shay." Knowledge of stress concentration and of behavior under repeated stress is needed for such design. Avoidance of stress-raisers and the relieving of parts so that stress concentrations also are avoided, are emphasized, with examples of proper design. Use of case hardening, nitriding, etc., to supply stronger portions at the locations of maximum stress, is urged. Use of materials that are not notch-sensitive for crankshafts is mentioned. Hollow axles and beams with a high moment of inertia due to their geometrical shape are advocated instead of using stock material in more easily produced shapes. Welded structures built up from castings and rolled shapes instead of more massive castings are recommended. Application of known principles would save raw materials and cut down dead weight of rolling stock. The author does not deal with the cost of construction according to such design but seems to make the tacit assumption that the weight saving would be worth the cost. HWG (14)

New Heatproof China Bowls Help Kitchen Mixer Maker. *Steel*, Vol. 100, Mar. 22, 1937, p. 66. Steel sheets, gray-Fe castings, Al die castings, and stainless steel are among materials used in parts of mixer and juice extractor. MS (14)

Pipe and Fittings. EDITORIAL STAFF. *Chem. & Met. Eng.*, Vol. 44, May 1937, pp. 265-268. Descriptive. A general description of pipe material, pipe fabrication and working pressures is given. PRK (14)

14a. Non-Ferrous

G. L. CRAIG, SECTION EDITOR

Office and Home; Domestic Appliances and Furniture. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 31. Describes use of Al for desks, chairs, and household appliances. MS (14a)

Sports and Pastimes; Varied Range of Equipment. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 37. Describes use of Al and its alloys in the manufacture of a number of items of sporting equipment. MS (14a)

Bicycles; Difficulties of Design. *Times Trade and Eng.*, Vol. 40, Mar., 1937, p. 48. Discusses use of Al alloys for bicycle parts. MS (14a)

Some Newer Uses. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 61. Note on some recently developed uses of Al sheet. MS (14a)

From Grand Piano to Lion's Cage. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 48. Note on some miscellaneous uses of Al in small ways. MS (14a)

Power Transmission; Aluminium Conductor Lines. THEODORE VARNEY. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 48. Describes extent of use of Al conductors and discusses factors affecting design of transmission lines. MS (14a)

Electrical Industry; Substitution for Copper. W. ZWANZIG. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 64. Describes applications of Al. MS (14a)

Ship Construction; Promising Field for Light Alloys. E. H. SMITH. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 42. Discusses use of Al alloys. MS (14a)

Preparation of the Printing-plate for Metal Decoration. H. W. DORRINGTON. *Sheet Metal Ind.*, Vol. 11, Jan. 1937, pp. 33-34. Zn plates have replaced the special litho-stone originally used. The graining of these plates by means of sized pumice or silver sand is discussed. AWM (14a)

Tin-printing or Metal Decoration. H. W. DORRINGTON. *Sheet Metal Ind.*, Vol. 10, Dec. 1936, p. 939. Practical. The printed tinplate is dried 30 min. at 200° C., then varnished and dried at about 220° C. for about 60 min. **Preparation of the Printing-plate for Metal Decoration.** IBID. *Sheet Metal Ind.*, Vol. 11, Jan. 1937, pp. 33-34. Zn plates have replaced the special litho-stone originally used. The graining of these plates by means of sized pumice or silver sand is discussed. AWM (14a)

Lead-lined Equipment. E. MANTIUS & H. F. FREIHERR (Nat. Lead Co.). *Ind. Eng. Chem.*, Vol. 29, Apr. 1937, pp. 373-377. Description of the type of equipment construction, lead sheet and pipe, used in the chemical industries. Selection of the correct grade of lead, as well as the proper design of equipment, is emphasized. MEH (14a)

Lead-base Bearing Metals Containing Magnesium (Magnesiumhaltige Bleilagermetalle) W. KROLL. *Tech. Zentralbl. prakt. Metallbearbeit.*, Vol. 47, Feb. 1937, pp. 180-181. Stresses the great difficulties involved in the manufacture of Pb-bearing metals hardened with Mg. EF (14a)

High-conductivity, Oxygen-free Copper (Hochleitungsfähiges, sauerstoffreies Kupfer) FR. KÜNSTEL. *Tech. Zentralbl. prakt. Metallbearbeit.*, Vol. 46, Dec. 1936, pp. 873-874. Notes on OFHC Cu, brought on the German market as "Liotorsokupfer." Emphasizes its physical properties and applications. EF (14a)

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Aluminium in the Heavy Engineering Trades. F. JOHNSTONE TAYLOR. *Indian & Eastern Eng.*, Vol. 79, Dec. 1936, pp. 601-602. Experience on the use of Al in bridge construction, in reflooring of old iron and steel bridges and in sewage works.
APS (14a)

Study of Optical Properties of Metallic Foils (Études des Propriétés Optiques des Lames Métalliques très Minces) PIERRE ROUARD (Univ. Marseilles). *Ann. Phys.*, Vol. 7, Mar. 1937, pp. 291-383. Original, exhaustive research on optical properties of Au, Ag and Pt foil between 0 and 40 μ thick. 66 references. See also *Metals and Alloys*, Vol. 6, Nov. 1935, p. MA 460L/6.
EF (14a)

Rubber Industry; Extensive Use of Aluminium. J. F. CROWLEY. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 61.
MS (14a)

Food Preservation; Progress in Canning. J. MÜRER & D. NICKELSEN *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 56. Discusses use of Al cans for packing foods. Lacquered or anodized metal must be used for acid products. MS (14a)

Tin-base Bearing Metals. B. P. HAIGH. *Metallurgist* (Supp. to *Engineer*), Aug. 1936, pp. 147-148. Review abstract and discussion of paper by F. v. Göler and H. Pfister. (See *Metals and Alloys*, Vol. 7, Oct. 1936, p. MA 506.) VVK (14a)

The Rare Earth Metals (Zur Kenntnis der Metalle der seltenen Erden) W. KLEMM & H. BOMMER. *Z. anorg. allgem. Chem.*, Vol. 231, Mar. 8, 1937, pp. 138-171. New research on the rare earth elements. All of these elements except Ho were prepared by reduction of the rare earth chlorides with alkali metals and the resulting mixtures of rare earth metals and alkali chlorides were studied by X-ray and magnetic methods, the alkali chloride impurities serving as dilution and calibration material. The observed lattice structures are for the most part hexagonal close packed. Allotropy was found in the cases of La, Ce, and Pr. Previous crystallographic data on these elements are critically reviewed. The atomic volume curves show marked maxima at Eu and Yb and weak minima at Ce, Pr, and Tb. The inference from these curves (that in the rare earth metals there appear not only tri-valent but also di- and tetra-valent ions) is substantiated by magnetic susceptibility measurements. Gd (recently reported as ferromagnetic) was the only one of these metals that showed all of the required characteristics of ferromagnetism. The neighboring elements show transition stages from para to ferromagnetism. HFK (14a)

Notes on Bearing Bronzes (Etwas über Lagerbronzen) E. LAY. *Tech. Zentralbl. prakt. Metallbearbeit.*, Vol. 46, Dec. 1936, pp. 833-835. Descriptive. Applications of Cu-Pb, Cu-Sn-P ("Phosphorbronze"), precipitation hardening Cu-Ni, Cu-Zn and Cu-Ni-Al ("Aluminiumbronze") are discussed. Cu-Pb bearings with 20-50% Pb have a higher melting point than Sn-, Pb- and Cd-base bearing metals, better adhesion and higher bending strength. Hardened shafts are used in Germany for Cu-Pb bearings. With the view of saving expensive Sn, centrifugal casting or cold working are applied in Germany to bronzes of lower Sn contents. In one operation, phosphor bronze of 8-9% Sn is now hot worked and its physical properties are greatly improved.
EF (14a)

The Use of Lead in Chemical Engineering Plant. A. R. NEVILLE (Canada Metal Co.). *Can. Chem. Met.*, Vol. 21, Apr. 1937, pp. 136, 138-139. A number of liquors are listed for which so-called pure Pb containers have been employed. The effect of alloying elements on the properties of Pb are pointed out. Pb containing 0.06% Te can be work-toughened so that its tensile strength is greatly increased and its resistance to fatigue increased 3-4 fold. Pb may be bonded to stronger materials with or without a bonding medium. Where heat transfer is of importance, the homogeneously Pb lined or covered equipment has a decided advantage over the loose lining or covering. The first cost is higher, but replacements are less frequent. WHB (14a)

Mercury-thallium Alloys and their Application for Thermometric Purposes (Ueber Quecksilber-Thallium-Legierungen und ihre Verwendung für thermometrische Zwecke) HELMUT MOSER. *Physik. Z.*, Vol. 37, Dec. 15, 1936, pp. 885-886. Vacuum treated Hg-Tl alloys are free from oxide and well suited for thermometric purposes if in contact with an inert gas. The eutectic alloys with 8.5% and 40.4% Tl have been investigated as to solidification point, density, expansion coefficient and vapor pressure. The 8.5% Tl alloy has a freezing point of —60.0° ±0.2° C. and can be used for low temperature measurements while the 40.4% Tl alloy is more suitable than Hg in thermometers for high temperatures. This alloy has a vapor pressure at 500° C. only half that of Hg. EF (14a)

14b. Ferrous

M. GENSAMER, SECTION EDITOR

Steel and Alloys for Permanent Magnets (Staal och legeringar för permanenta magneter) *Tek. Tid.*, Vol. 67, Jan. 9, 1937 (Section *Bergsvetenskap*) pp. 6-7. Review of paper by André Michel: "Les Aciers et alliages pour aimants permanents," Congrès International des Mines, de la Métallurgie et de la Géologie appliquée, 7th Session, Paris, Oct. 20-26, 1935, Section of Metallurgie. See *Metals and Alloys*, Vol. 7, Apr. 1936, p. MA 203R/7.
BHS (14b)

General Requirements and Nickel Alloy Steels Used in Oil Production Equipment. A. G. ZIMA (Int. Nickel Co.). *Metal Progress*, Vol. 31, Apr. 1937, p. 407. Data sheet showing requirements and recommended steels for various oil-well equipment.
WLC (14b)

Manifold Utility of Acetylene-welded Steel Tubes (Vielseitige Verwendung des Stahlrohrs durch die Azetylenschweissung) J. J. THIESSEN. *Autogenschweisser*, Vol. 10, Mar. 1937, pp. 27-29. See *Metals and Alloys*, Vol. 8, Mar. 1937, p. MA 156R/7.
EF (14b)

Newer Steels Save Weight. GEO. LANDIS (Lincoln Elec. Co.). *Am. Machinist*, Vol. 81, Apr. 21, 1937, p. 330. A table gives compositions and physical properties of typical low-alloy high-tensile steels which can be welded by much the same process as C steels and have greater strength. Ha (14b)

Glass-lined Steel Equipment. P. S. BARNES (Pfaudler Co.). *Ind. Eng. Chem.*, Vol. 29, Apr. 1937, pp. 378-379. Descriptive. The requirements of the steel shell destined for glass lining are briefly presented. MEH (14b)

Cast Iron and the Automobile (La Fonte et L'Automobile) RAYMOND CHAVY. *La Fonte*, No. 23, Sept.-Oct. 1936, pp. 863-875. A review of the progress made in the use of cast Fe in automobile manufacture. Types of metal suitable for different parts are given. 14 references. WHS (14b)

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15. GENERAL

Preliminary Investigation of the Distribution of Elements in Some Swedish Iron Ores (En Orienterande Undersökning över Elementfördelningen i Några Svenska Järnmalmstyper) STURE LANDERGREN. *Jernkontorets Ann.*, Vol. 120, Dec. 1936, pp. 711-737. X-ray spectrum analysis gave the following main conclusions: In the Fe group the ratio Co:Ni is considerably less than unity in ores formed during an early magmatic stage but increases in ores formed during a later magmatic stage and may reach a value equal to or greater than unity. In sedimentary ores the ratio is much less than unity. The distribution of rare earth metals in orders formed during an early stage of magmatic evolution is very similar to that found in stone meteorites. In the later stages the elements of pronounced basicity increase in concentration and this is completed in sedimentary ores. Ores connected in some way with granite intrusions have a high concentration of Zr, Mo and Sn. HCD (15)

Design, Finish and Mechanical Perfection Impart Sales Appeal to Modern Bicycle. *Steel,* Vol. 100, Apr. 12, 1937, pp. 74, 76, 96. Describes methods used by Cleveland Welding Co., Cleveland, O., in fabrication and finishing of bicycles. MS (15)

Timken Research and Testing Facilities. *Blast Furnace Steel Plant,* Vol. 25, Apr. 1937, pp. 388-390. **Timken Expands Research and Testing Facilities.** *Heat Treating Forging,* Vol. 23, Apr. 1937, pp. 174-176. **Bearing Manufacturer Expands Research and Testing Facilities.** *Steel,* Vol. 100, Apr. 12, 1937, pp. 50-54, 95. Describe new quarters and additional equipment of Timken Roller Bearing Co., Canton, O., for testing bearings. MS (15)

Development Work on Gold and Base Metal Mines. *Chem. Eng. Mining Rev.,* Vol. 29, Mar. 8, 1937, pp. 226-228. Tables show essential details relating to 11 Australian mines and a record of the number of yrs. life, the number of tons milled per ft. of development and similar details. WHB (15)

Ontario's Iron Ore Industry. STAFF WRITER. *Can. Chem. Met.,* Vol. 21, Mar. 1937, pp. 90-92. Historic, economic and international considerations. WHB (15)

Metallurgical Progress. *Times Trade and Eng.,* N. S., Vol. 40, Apr. 1937, p. 34. Review of recent advances in alloy steels, nitriding of stainless steels, metallizing, V-steel castings, cemented carbide tools, and steel tools. MS (15)

A.S.T.M. Committees Formulate New Tests and Specifications to Supplement Standards. *Steel,* Vol. 100, Mar. 22, 1937, pp. 63, 65-66. Summary of work accomplished by various committees on ferrous and non-ferrous metals. MS (15)

Modern Methods Shown in Roll Grinding Shop: *Steel,* Vol. 100, Apr. 26, 1937, pp. 55-56, 89-90. Describes steel-works and roll-turning shop of Henry Disston & Sons, Inc., Phila., with much attention to handling methods. MS (15)

Status of Our Knowledge of the Properties of Metals; Their Insufficiency; Program to Improve Them (État de nos Connaissances sur les Propriétés des Métaux; leur Insuffisance; Programme pour les compléter) P. CHEVENARD (St. Étienne Mining School). *Usine,* Vol. 46, Mar. 25, 1937, pp. 31-35. A general review of metallurgical, physical and chemical knowledge pertaining to metals and discussion of gaps to be filled. Ha (15)

The Application of Non-ferrous Metals and Alloys. CLEMENT BLAZEY. *Commonwealth Engr.,* Vol. 24, Sept. 1, 1936, pp. 53-66. General review including bronze and brass castings and forgings, hot pressings and forgings, die castings, powdered metals and alloys, extruded sections, sheet metal, bearing alloys, light alloys, electrical conductors and resistance alloys, and heat resistant alloys. EF (15)

Use of Sound and Supersonic Waves in Metallurgy. V. H. GOTTSCHALK & H. W. ST. CLAIR (U. S. Bur. Mines) *Mining and Met.,* Vol. 18, May 1937, pp. 244-247. Review of the use of sound waves in metallurgy. Some of the applications are: in locating gas bubbles, inclusions and cracks in metals; in accelerating nitriding, carburizing and cementation; dispersion of metals in melts, etc. Also describes the method of producing suitable sound waves. VSP (15)

Geology and Ore and Mineral Deposits of Djeskasgan District. K. I. SATPAEV. *Tzvetnve Metal.,* No. 9, Oct.-Nov. 1935, pp. 26-40. A geological description and summary of available and possible mineral resources of the Djeskasgan District in Russia. BND (15)

Forging and Finishing Steel Knives. FRED B. JACOBS. *Steel,* Vol. 100, June 14, 1937, p. 40-42, 44. Describes the principal operations performed in the forging, grinding, and polishing of knives at the plant of the Northampton Cutlery Co., Northampton, Mass. MS (15)

Recent Developments in the Uses of Aluminum (Die neuere Entwicklung der Verwendung des Aluminiums) HANS SCHMITT. *Aluminium,* Vol. 19, Apr. 1937, pp. 235-243. General statistical survey. Ha (15)

Development of Tin Industry in Russia. N. N. MURACH. *Tsvetnye Metal.,* No. 3, Apr. 1936, pp. 16-26. The author describes briefly the results of recent exploration of Sn deposits in various parts of Russia and the status of Sn production. BND (15)

Edward Bausch—A Biography. EVERETT W. MELSON. *J. Applied Phys.,* Vol. 8, May 1937, pp. 337-340. Biographical notes on Edward Bausch and the industrial and scientific achievements of the Bausch and Lomb Co. HFK (15)

Industrial Minerals in the Non-ferrous Metallurgical Industry. W. E. NEWTON, T. V. LORD, T. H. WELDON & R. D. PERRY. *Trans. Can. Inst. Mining & Met.,* Vol. 39 (in *Can. Mining & Met. Bull.* No. 296, Dec. 1936), pp. 759-766. A discussion of refractories, fluxes, and construction materials with notes on other uses of lime rock, lime, MnO_2, Na_2CO_3, Na_2SO_4, NaCl, SiO_2 and fluorspar. AHE (15)

15a. Economic

New Knowledge of Zinc Die- and Pressure-Casting, with Special Attention to American Practice (Neue Erkenntnisse über Zink-Spritz- und Pressguss unter besonderer Berücksichtigung amerikanischer Erfahrungen) J. DORNAUF. *Z. Metallkunde,* Vol. 29, Feb. 1937, p. 53-60. Review. An historical survey of the development of Zn alloys with Al and Cu and their commercial use. American die-casting technique and the properties of Zamak alloys are discussed. GD (15a)

The Menace of Dust in Metal Mining. D. HARRINGTON (U. S. Bur. Mines) *Eng. Mining J.,* Vol. 138, Mar. 1937, pp. 119-123. It is generally believed that the max. harm to health from dust is due to breathing silica dust in sizes of 10 microns or less and this silica dust in the lungs dissolves in or is chemically combined with the fluids of the lung tissue with resultant chem. action causing transformation, partial or entire destruction of the tissue. Prevention of dust, as far as possible, is the safest course and the best remedy for the dust menace in mines appears to be the universal coursing of currents of air to remove the dust. Means of sampling of dust-laden air, and of reducing the dangers of dust poisoning are noted. WHB (15a)

Soviet Russia; Programme of Development. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 37. Brief sketch of Russian Al industry. MS (15a)

Japan; Desire to Save Imports. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 37. Brief sketch of Japanese Al industry. MS (15a)

New Factories in Italy; Intensive Activity. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 38. Survey of the Italian Al industry. MS (15a)

Spain; Developments under Difficulty. *Times Trade & Eng.,* Vol. 40, Mar. 1937, p. 19. Sketch of Al industry. MS (15a)

Austria; Small Production. *Times Trade and Eng.,* Vol. 40, Mar. 1937, p. 24. Sketch of Al industry. MS (15a)

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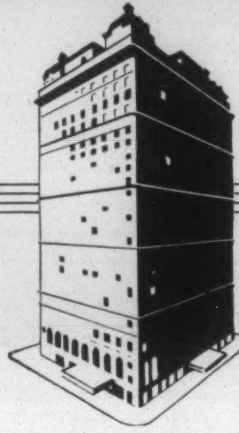

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A Review of the Zinc Industry and World Zinc Situation. Am. Zinc Inst., Preprint, Apr. 1937. Symposium, mainly statistical. Contains the following papers: **The European and World Zinc Situation in 1936**, O. W. Roskill; **The Zinc Industry in Canada**, W. B. Timm; **Zinc Mining in the Rocky Mountain Region**, J. O. Elton; **Zinc Mining in the Eastern Region, Including Virginia**, Russell B. Paul; **Zinc Mining in the Mississippi Valley Region**, Evan Just; **Retort Smelting Operations**, Robert Ammon; **Electrolytic Operations**, C. R. Ince. BHS (15a)

Scrap, Beggar in '32, Leader in World Strategy Today. *Steel*, Vol. 100, Mar. 29, 1937, pp. 15-18. Discussion of export trade in ferrous scrap. Greater part of exports from United States is taken by Japan, Italy, and the United Kingdom. Attitude of most of world is to keep scrap at home for domestic melting. Includes statistics. MS (15a)

Utility and Economy of Electrically Heated Melting Furnaces for Light Metals (Anwendungsbereich und Wirtschaftlichkeit der elektrisch beheizten Leichtmetallschmelzöfen) U. Schwedler. *Tech. Zentralbl. prakt. Metallbearbeit.*, Vol. 47, Feb. 1937, pp. 147-151. Descriptive. Discusses crucible, hearth and induction furnaces for melting light metal alloys. Emphasizes economic viewpoints. EF (15a)

Problems of Foundry Modernization. R. H. Ure. *Mech. World Eng. Record*, Vol. 101, Feb. 5, 1937, pp. 125-126. Discusses problem from a purely economic viewpoint. EF (15a)

Economic Use of Raw Materials by Proper Welding Design of Machinery (Schweissrichtige Rohstoffverwendung und Gestaltung im Maschinenbau) Franz Krynes. *Autogenschweisser*, Vol. 10, Mar. 1937, pp. 30-31. Descriptive. Two typical examples, (1) design, assembly and heat treatment of recuperator made of heat resistant Cr-Ni steel, and (2) impeller and shaft of gas turbine are described in detail. EF (15a)

Magnesium Industry in 1936—Advance Summary. Herbert A. Franke. *U. S. Bur. Mines, Mineral Market Repts.*, No. M. M. S. 544, May 20, 1937, 2 pp. Statistical. AHE (15a)

Hungary; Large Deposits of Bauxite. Baron Weiss (Manfred Weiss Works) *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 19. Sketch of Al industry, and description of the Manfred Weiss Works, which uses the Söderberg system. MS (15a)

In the Empire; Development in the Dominions. *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 11. Survey of Al industry in British Dominions, with chief attention to Canada. MS (15a)

Soviet Heavy Industries, Recent Development and Output in 1936. *Iron & Coal Trades Rev.*, Vol. 134, Feb. 26, 1937, p. 402. Statistics and outlook for 1937. Ha (15a)

Bureau of Standards Lists Nation's Testing Laboratories. *Ind. Standardization*, Vol. 7, Sept. 1936, p. 240. The "Directory of Commercial Testing & College Research Laboratories," includes 224 commercial testing and 200 college laboratories in the U. S. and shows the type of commodities which they are prepared to test. Obtained from Gov. Printing Office, D. C., for 15 cents. AGS (15a)

Base Metals. *Suppl. Financ. News, London*, Apr. 20, 1936, p. 32. A useful survey of the non-ferrous metals position. The chapters include: **The Uses of Non-ferrous Metals**, A. R. Powell; **Copper under a Sound Control; Growth of the Empire Zinc Industry**, Robert Horne; **Alloy Steel Metal**, O. W. Roskill; **Aluminium and Magnesium; The Place of Nickel in Industry**, D. Owen Evans; **Central Africa's Copper Belt; Tin Dredging in Malaya**, A. A. Hengeler; **The Broken Hill Lead and Zinc Mines**, W. A. Macleod; **Recovery of Base Metals from their Ores.** APS (15a)

The Bauxite Industry in 1936—Advance Summary. Herbert A. Franke & C. T. Herring. *U. S. Bur. Mines, Mineral Market Repts.*, No. M. M. S. 540, Apr. 30, 1937, 2 pp. Statistical. See *Metals and Alloys*, Vol. 8, May 1937, p. MA 308R/8. AHE (15a)

Iron and Steel Imports and Exports of Belgium and Luxembourg in 1936. *Iron & Coal Trades Rev.*, Vol. 134, Feb. 26, 1937, pp. 398-399. Statistics on ore, scrap, semi-finished and finished materials. See *Metals and Alloys*, Vol. 8, June 1937, p. MA 382R/5. Ha (15a)

15b. Historical

Review of Progress in Ferrous Metallurgy. Albert Sauveur. *Steel*, Vol. 99, July 6, 1936, pp. 38-42. See *Metals and Alloys*, Vol. 8, Feb. 1937, p. MA 110R/10. MS (15b)

Mining in Ontario During 1936. A. C. Young. *Can. Mining J.*, Vol. 58, Feb. 1937, pp. 66-71. A record year. WHB (15b)

Some Trends in Mining Gold and Silver Ores. M. W. von Bernewitz. *Eng. Mining J.*, Vol. 138, Mar. 1937, pp. 135-139. An historical review. Various phases of ore dressing and related topics are dealt with briefly. Sorting is practical in ores such as those from Alaska Juneau, Cripple Creek, Howey, Kolar, Morro Velho, the Rand, and the Yellow Aster mines. Grinding is becoming progressively finer, some mines crushing to 400-mesh. Flowsheets are shown for the Coburn mill at Kirkland Lake, Ont., and for the Benquet Consolidated's Ipo mine in the Philippines. Countercurrent decantation is conducted at both plants. Au bullion of 850-900 fineness is produced. At the Mont Tsi Au mine of the Kilo-Moto Co. in the Belgian Congo amalgamation plus corduroy are the sole means of Au recovery. The grinding in Chilean mills is followed by amalgamation plus corduroy, de-watering, tube milling, and classification and a second amalgamation and corduroy. Statistical data are given for Au and Ag ore treatment in the U. S. and old and new processes are compared. WHB (15b)

British Enterprise; Forty Years of Progress. W. Murray Morrison (British Aluminium Co.) *Times Trade and Eng.*, Vol. 40, Mar. 1937, p. 11. Outlines briefly early history of Al and history of British Aluminium Co.; position of United Kingdom with regard to manufacture and supply of Al; and uses. MS (15b)

Ye Ancient Copper Mine of Arent Schuyler. O. I. Lee. *Rocks & Minerals*, Vol. 12, Apr. 1937, pp. 99-109. Historical account of Cu mine at North Arlington, N. J., on the edge of the Hackensack meadows, discovered in 1715 and worked till 1865. Some of the workings are still accessible. It is calculated that 5 million tons of ore averaging 2.5% Cu are still available. A leaching process designed to treat the ore was tried in 1899-1903, but failed. Extremely interesting account of a mineral deposit within sight of N. Y. skyscrapers. HWG (15b)

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WANTED: Superintendent for non-ferrous ingot smelting plant in Great Lakes district. Must be familiar with construction and operation of reverberatory furnace, production of red and yellow alloys, aluminum and white metals. Reply giving complete information as to experience, qualifications and salary expected, will be treated with absolute confidence. Box MA-48.

POSITION WANTED: Physical chemist and metallurgist desires change. Ph.D. in physical chemistry and physical metallurgy. Four years of industrial experience. Six years' experience teaching metallurgy in engineering schools. Will consider either industrial or teaching position. Box MA-49.

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POSITION WANTED: Well trained metallurgist, last 8 years as chief metallurgist and sales metallurgist with tool steel mill wishes position as sales metallurgist. Box MA-52.

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Book Reviews

JAPAN NICKEL REVIEW

Vol. 4, April 1936

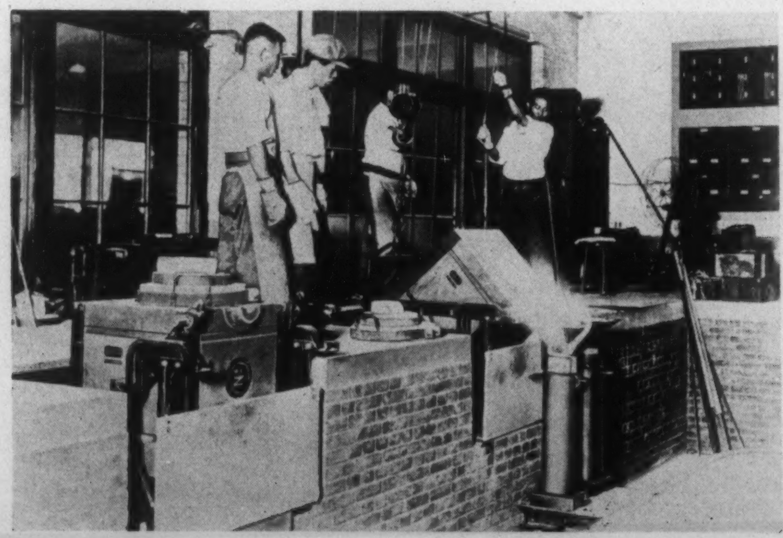
Japan Nickel Information Bureau, Tokyo, 1936. Paper, 177 pages.

This issue, coming somewhat belatedly to hand, is worthy of comment both as a record of Japanese endeavor in metallurgy and as promotional literature.

The Japan Nickel Information Bureau has been able to tuck itself under the government wing to some extent, since on its roster of advisers and counselors are three members of the House of Peers, to say nothing of a couple of viscounts.

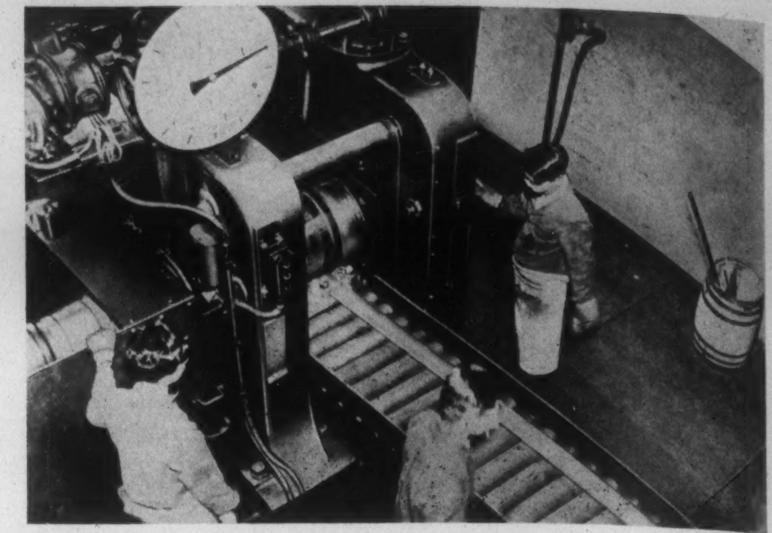
The articles naturally refer largely, though not exclusively to metallurgical uses of nickel. An account by Saito of studies on nickel alloys at Kyoto Imperial University; four articles—on stainless steels, nickel alloy steel in machine construction, nickel cast iron, and non-ferrous alloys in general—are by professors at Tokyo Imperial University. An account by Honda, of Tohoku Imperial Univ., on Japan's Progress in the Science of Iron and Steel, lists quite an imposing array of subjects on which Japanese investigators have worked. While, with Japanese pride, this is phrased as if much of the work that was repetition of earlier work in other countries was quite original, and dogmatic statements are made as to the validity of some of Honda's own theeories which lack general acceptance, nevertheless a rather creditable array of valuable work is presented. The names of Murakami and Sato are well known all over for their work on metallographic etching and the iron-carbon diagram respectively, while in the field of permanent magnets, Honda, Mishima, Masumoto and Kato are recognized as having done highly creditable and pioneer work.

An article by Yamaguchi of the Nickel Bureau deals with the development of magnet steels.



While some of these articles are a bit self-centered and credit Japan with a somewhat greater contribution toward metallurgical knowledge than would most observers, a couple are written in quite unassuming fashion. One of these, on resistor wires concludes "It is too much to say that the domestic made heating wires are superior to European and American Standards, but it is true that they have nearly reached those standards."

Another is on the introduction of pure nickel for coinage, by the Technical Director of the Mint, who was faced with the problem of supplying nickel coins on a definite date. He decided to use high frequency furnaces for melting and these were installed just two months before the first coins had to be delivered, leaving little time for experimentation. He had been advised to forge his ingots before rolling, but this process would have been so slow that he could not meet his delivery date so he tried hot rolling ingots direct from the molds, and got away with it, though the plant had not previously done any hot rolling. The strip is then cold rolled and the coin blanks stamped out. About 30% of the melt comes out as accepted blanks. He explains that his process wouldn't work for large sheet where a single flaw would spoil the sheet, but a large part of the discs from strip with some defects will be all right. Through the courtesy of the Ajax Electrothermic Corp., Trenton, N. J., we show illustrations of pouring and rolling.



Abstracts of a number of articles on metallurgical subjects that had been published in Japanese metallurgical journals, claims and alloy compositions of 39 recent Japanese metallurgical patents, together with a bibliography of over 200 articles by Japanese metallurgists dealing with metallurgical applications of nickel, complete the issue.

We should imagine that any Japanese industrialist who perused the issue would feel that nickel and Japanese metallurgy were synonymous. The whole job is very neat propaganda.

This publication is bilingual—one column in English and one in Japanese. We suggested in respect to a similar bilingual printing of an issue of ***Stahl und Eisen*** that it would make a good "pony" for the study of metallurgical German. We fear that life's too short for anyone to learn both metallurgy and Japanese, so we'll refrain from applying the suggestion to this case.—H. W. Gillett.

TECHNOLOGY OF ZINC ALLOYS

(Technologie der Zinklegierungen) **A. Burkhardt**

Julius Springer Verlag, Berlin, 1937. Paper, 6¼x9¼ in., 256 pages. Price 30 RM.

A comprehensive summary of the factors affecting the properties of commercial zinc alloys, including composition, effect of aging, and defects introduced by faulty methods of handling. While rolling, pressing, extrusion, wire drawing and other types of casting are discussed quite adequately, main emphasis is placed on die casting.

The equilibrium diagrams for the useful binary alloys are discussed, and the Zn-Al-Cu system is presented in great detail, with solid diagrams for all physical properties, and with special reference to dimensional changes. The effect of small additions of Mg is equally fully set forth. While some of the alloys most used in Germany vary a bit from those most popular here, the relationship is close enough for the book to be very useful to American metallurgists. Few alloys require as close attention to purity, composition, and control of temperature and other casting conditions as do these, and all these variables are discussed in detail.

No attempt is made to evade the short comings of the alloys; the brittleness of some of them when not handled just right and the tendency toward porosity of die castings not properly designed nor intelligently produced, are not ignored.

Die casting technique is only briefly described, to bring out the principles involved. The book has the metallurgical aspect throughout, the mechanical aspect being subsidiary. Some attention is paid to finishing problems, the effect of variables in machining being quite clearly presented, and brief comment is made on cleaning and plating.

The book deserves a place on the shelves of every metallurgist dealing with zinc base die castings.—H. W. Gillett.

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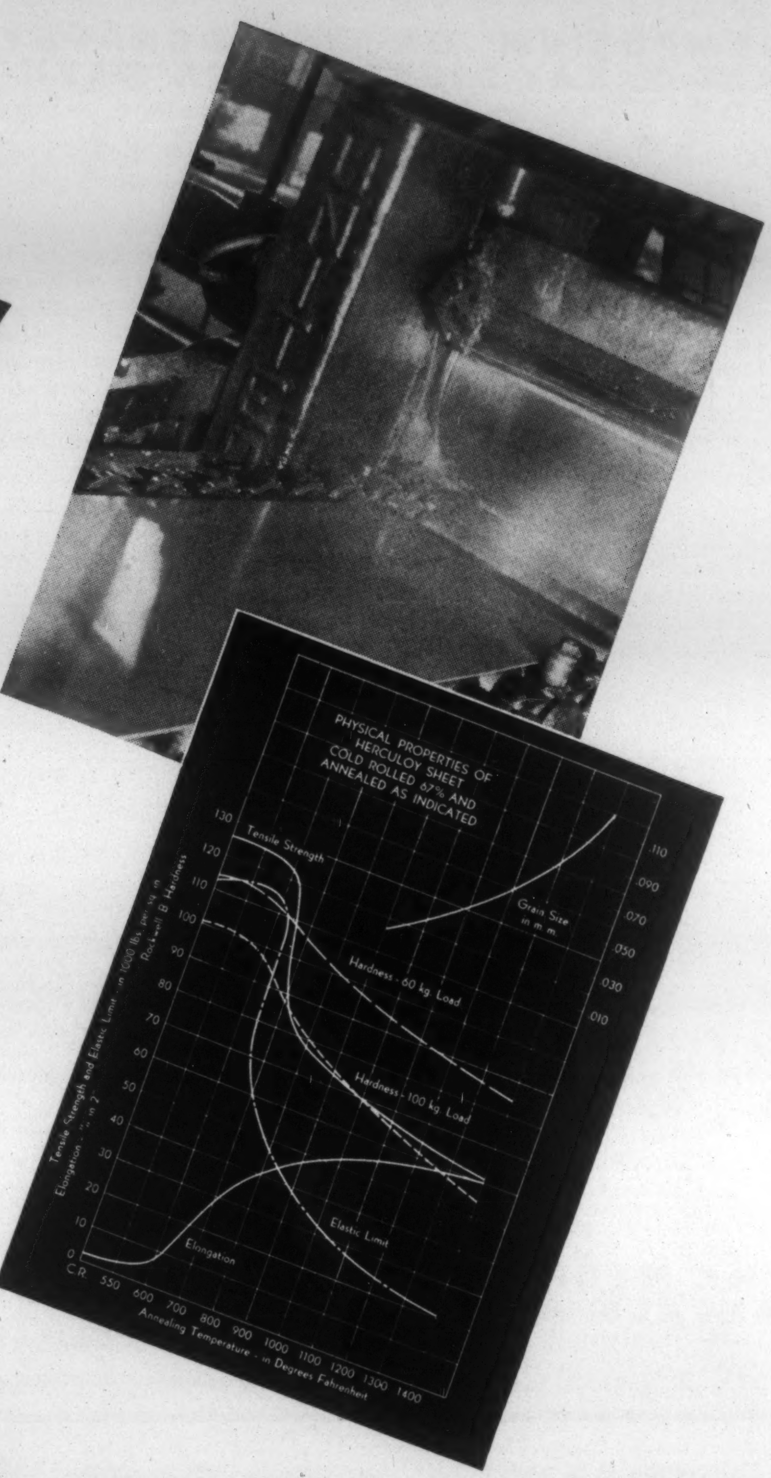

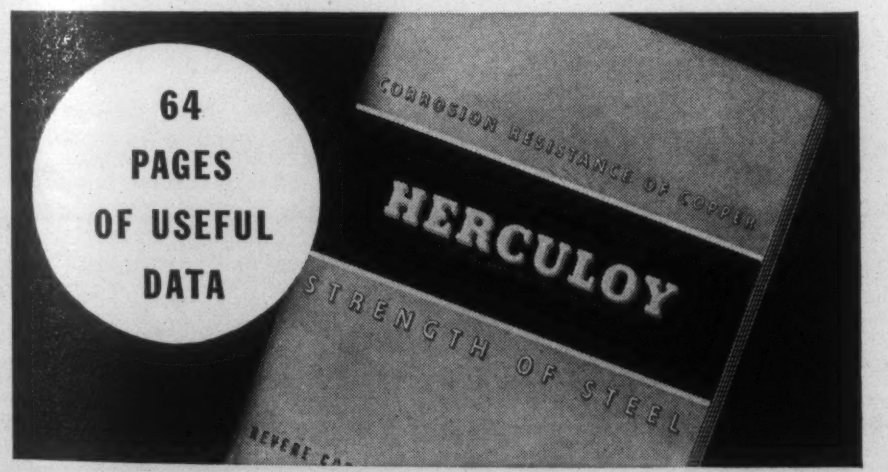

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SYMPOSIUM ON RADIOGRAPHY AND X-RAY DIFFRACTION METHODS.

American Society for Testing Materials, Philadelphia, 1936. Paper, 6 x 9 in., 350 pages...Price $4.00.

This symposium of 12 papers is a careful condensation of 45 papers presented at a preliminary symposium of the society in 1935. Its preparation was begun in 1934 by Subcommittee VI, on X-ray methods, of Committee E-4, of which Robert F. Mehl was chairman. The first symposium was open to the members of the Society and the submitted manuscripts were assigned to a group of experts who edited, summarized and condensed the whole into a small number of papers, which were presented at the 1936 meeting, and which comprise the present, separately published volume. The following is a list of the papers included:

"The Principles of the Radiographic Process," by John T. Norton, 18 pages.

"Foundry Applications of Radiography," by Earnshaw Cook, 23 pages.

"Radiography in the Welding Shop," by J. C. Hodge, 33 pages.

"Miscellaneous Applications of Radiography and Fluoroscopy," by Herman E. Seemann, 20 pages.

"Gamma-Ray Radiography and its Relation to X-ray Radiography," by Norman L. Mochel, 36 pages.

"The Problem of Radiographic Inspection," by H. H. Lester, 24 pages.

"X-Ray Diffraction Equipment and Methods," by Charles S. Barrett, 33 pages.

"The Constitution of Alloys," by Kent R. Van Horn, 53 pages.

"Chemical Analysis by X-Ray Diffraction Methods," by Wheeler P. Davey, 13 pages.

"Application of X-Ray Methods to Problems of Cold Work, Preferred Orientation and Recrystallization," by John T. Norton, 22 pages.

"The X-Ray Determination of Particle Size," by G. H. Cameron and A. L. Patterson, 14 pages.

"The Applications of the X-Ray Diffraction Method to Non-Metallic Materials," by George L. Clark, 12 pages.

An abstract of the contents of each of these papers will be found in the Current Metallurgical Abstracts section of this magazine.—V. V. KENDALL.

THE MECHANICAL TESTING OF METALS AND ALLOYS

P. F. Foster

Pitman Publishing Corp., New York, 1936. Cloth, 5¼ x 8¾ in., 267 pages. Price $3.75.

The author is a professor at University College, Cardiff. The sub-title is "the theory and practice of standardized mechanical testing." There is very little on theory and much of the practice consists in pointing out the construction of different makes of English testing apparatus. It is all too largely a "correlated catalog" of equipment. We can get catalogs without buying a book. Foster has written just another book, fairly up to date as to English equipment and reasonably helpful from the point of view of a laboratory assistant who turns in test data with no metallurgical responsibility as to their use.

The usual standardized tests are described, impact among them, but one looks in vain for any comment on the shift of impact resistance with change in temperature and with varying width of test bar. Instead he finds various impact conversion formulae, which though stated to hold only over limited ranges, are given more prominence than they deserve. Yield strength is roughly described but the methods of plotting data to give it, and any adequate discussion of the elastic range in this connection, are omitted. Under fatigue, the "over night" methods are stressed to a degree which Professor Moore would not be likely to approach were he the author; also it does seem odd that fatigue should be discussed without mention of corrosion fatigue. The discussion of creep testing is superficial and confined to a particular outfit at Metropolitan Vickers.

The author can hardly avoid some brief excursions into metallurgy, but when he does make them, his heart isn't in it nor are the excursions very helpful or convincing. There is no unusual percentage of misinformation and from its own limited point of view, covering the commercial tests most commonly specified in England, it is quite passable. But we always open books of this type in the hope that someone has dealt adequately with the philosophy of testing from the point of view of the metallurgist, and have so far always been disappointed. We wish some truly qualified person, say one like Templin, would write the book that ought to be written on this general subject.—H. W. GILLETT.

METALLURGICAL ENGINEERING AS A CAREER

Institute for Research, Chicago, 1937. Paper, 8½ x 11 in., 20 pages. Price $1.00.

This is Monograph No. 76 of the Institute's "Careers" series; to date 77 separate bulletins have been issued to indicate the nature of and opportunities in a variety of industries and professions from interior decorating or tea-room operation to government service and including each of the important divisions of engineering.

This monograph discusses the history of the art and science of metallurgy, the development of metallurgical engineering, a good picture of the industry, and a general description of the manufacture of steel. The attractive and unattractive sides of the profession are then presented with a discussion of starting and ultimate opportunities and salaries, a word-picture of a typical day's work in different branches of metallurgy (production, research and development, sales), education and personal qualifications required and the most probable lines of promotion.

The book has apparently been prepared by a practicing metallurgical engineer as descriptions of operations and the industry seem accurate. The unattractive and attractive sides are fairly presented. We are told that the location of plants is not always desirable, that advancement in fabricating plants near large cities may be slow, and that working conditions on a production job are not always pleasant; on the other hand the author believes that "there is more variety and less routine in metallurgical engineering than in other engineering fields" and that opportunities for advancement to executive posts are greater here than in any other engineering field. Starting salaries are above the average because the demand for trained metallurgists is greater than the supply.

The reviewer shares completely the optimism of the author of the bulletin, and from very recent contacts with several metallurgical educators knows that the statements concerning the unusually great demand for young metallurgists are not in the least exaggerated. It is only a question of time, however, until our greener pasture becomes more populous, but even then, overcrowding will hardly result for a long while, as the pasture itself is growing steadily larger.

This, and many other monographs in the series should certainly be made available to young men in high school and early college that are interested in, but undecided about, a career in metallurgical engineering.—FRED P. PETERS.

GENERAL AND TECHNICAL ELECTROCHEMISTRY OF NON-METALLIC MATERIALS

(Allgemeine und technische Elektrochemie nichtmetallischer Stoffe)

R. Mueller

J. Springer, Vienna, 1937. Cloth, 6 x 9 in., 440 pages. Price 30 R.M.

In a book with this title one would scarcely expect much of interest to the metallurgist. However, the electrode potential of the metals, cathodic reduction and anodic oxidation of polyvalent metals, electro-endosmose, plating of rubber, and an extended discussion of anodizing aluminum, are subjects that do have interest for quite a fraction of the metallurgists.

The usual topics, production of H_2, O_2, Cl_2, NaOH, organic reduction, formation of per-salts and the like are thoroughly dealt with. References to technical and patent literature are plentiful. As is usual in Springer books, the book-making is excellent. The sentences average quite short, so that, on the whole, it is easy German.—H. W. GILLETT.

Zinc and its Alloys *(Zink und seine Legierungen—Heft 1)*

Arthur Burkhardt

N. E. M. Verlag, Berling, 1937. Paper, 8¼ x 11¼ in., 40 pages. Price 5.00 RM.

Handbook type of information on zinc dealing with properties of the metal in different forms, effect of impurities and of alloying elements, with particular attention to die casting alloys and their behavior. This is chiefly a reprinting of the 1934 Edition with slight extension in relation to die casting alloys. The 386 references remain as in the previous edition, so that as a literature finding list it has not been brought up to date.—H. W. GILLETT.

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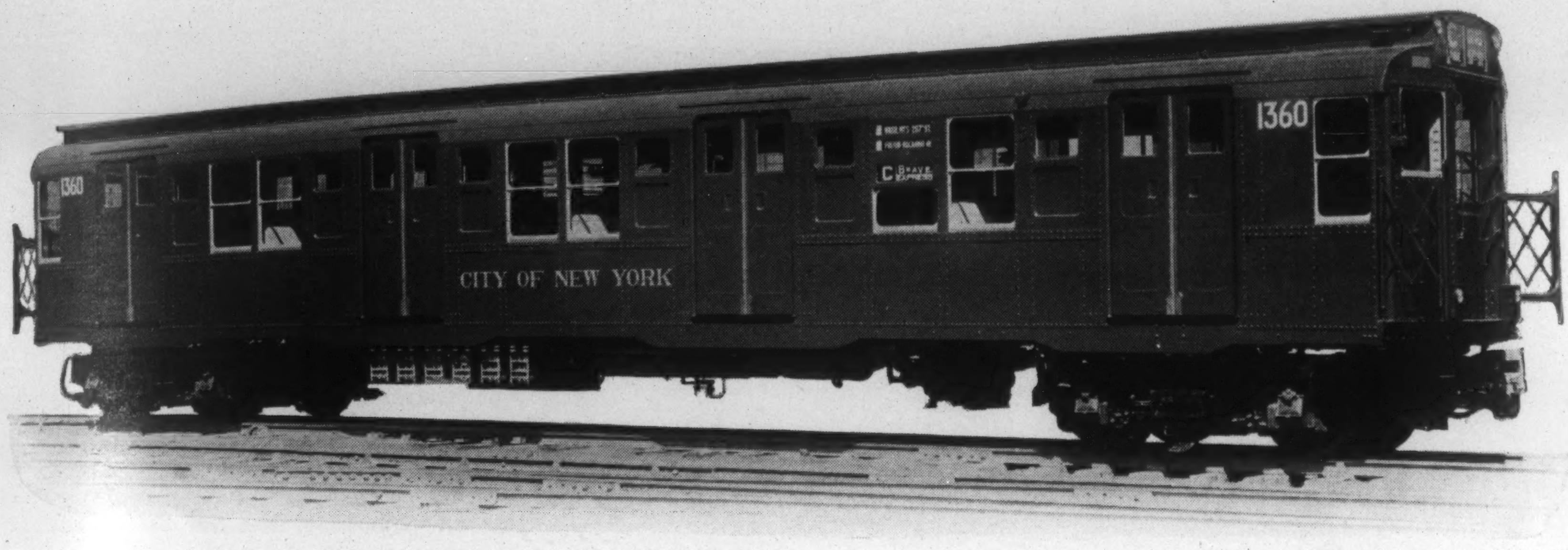

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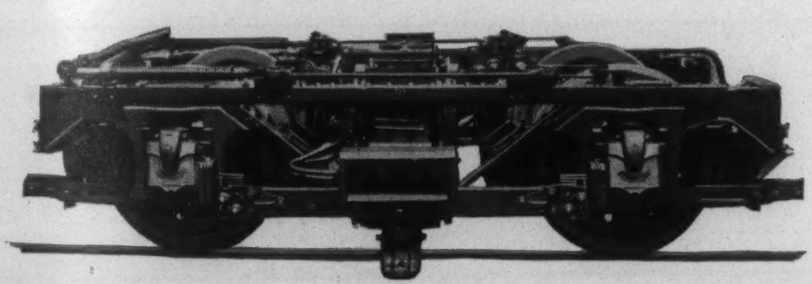

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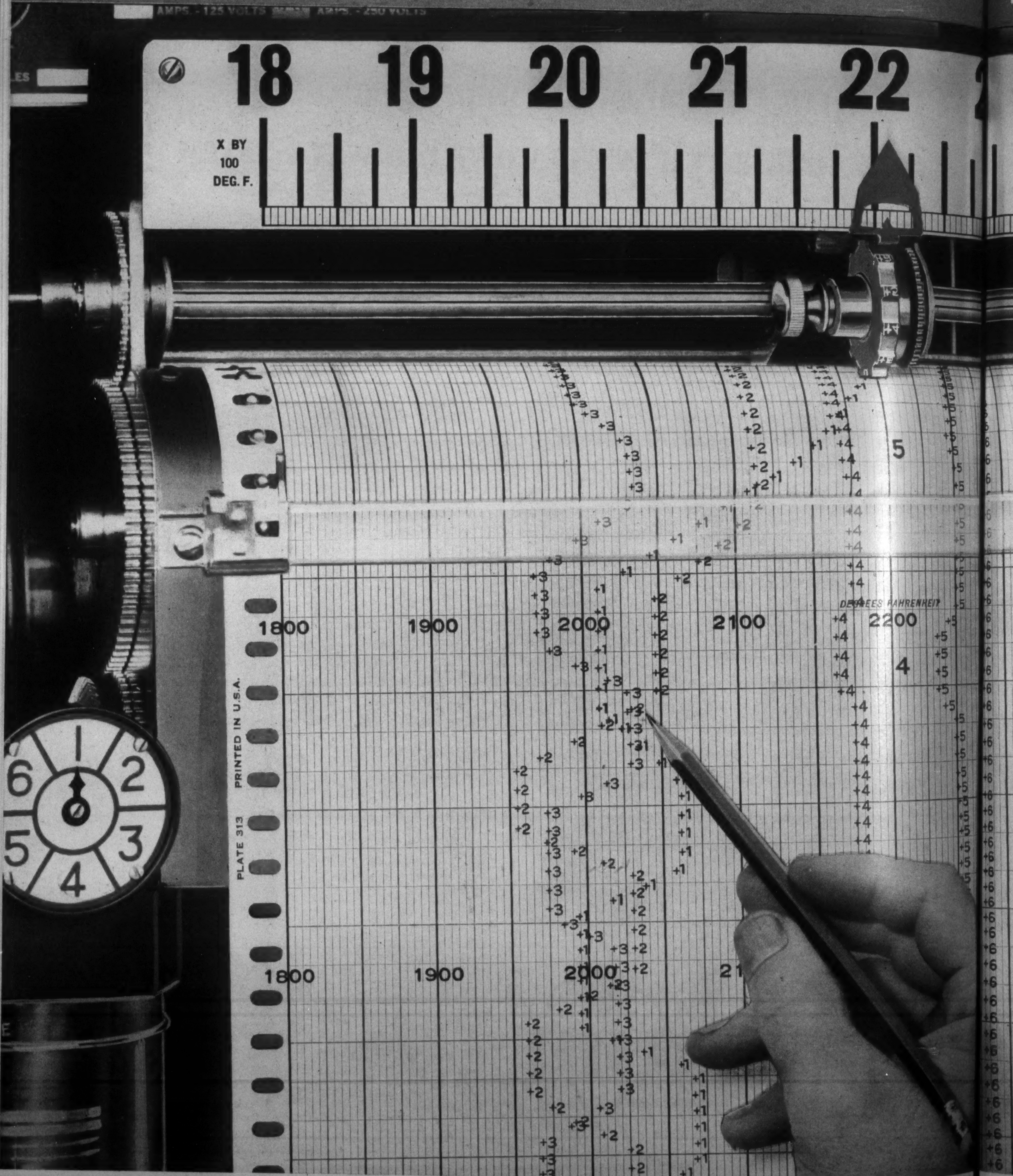
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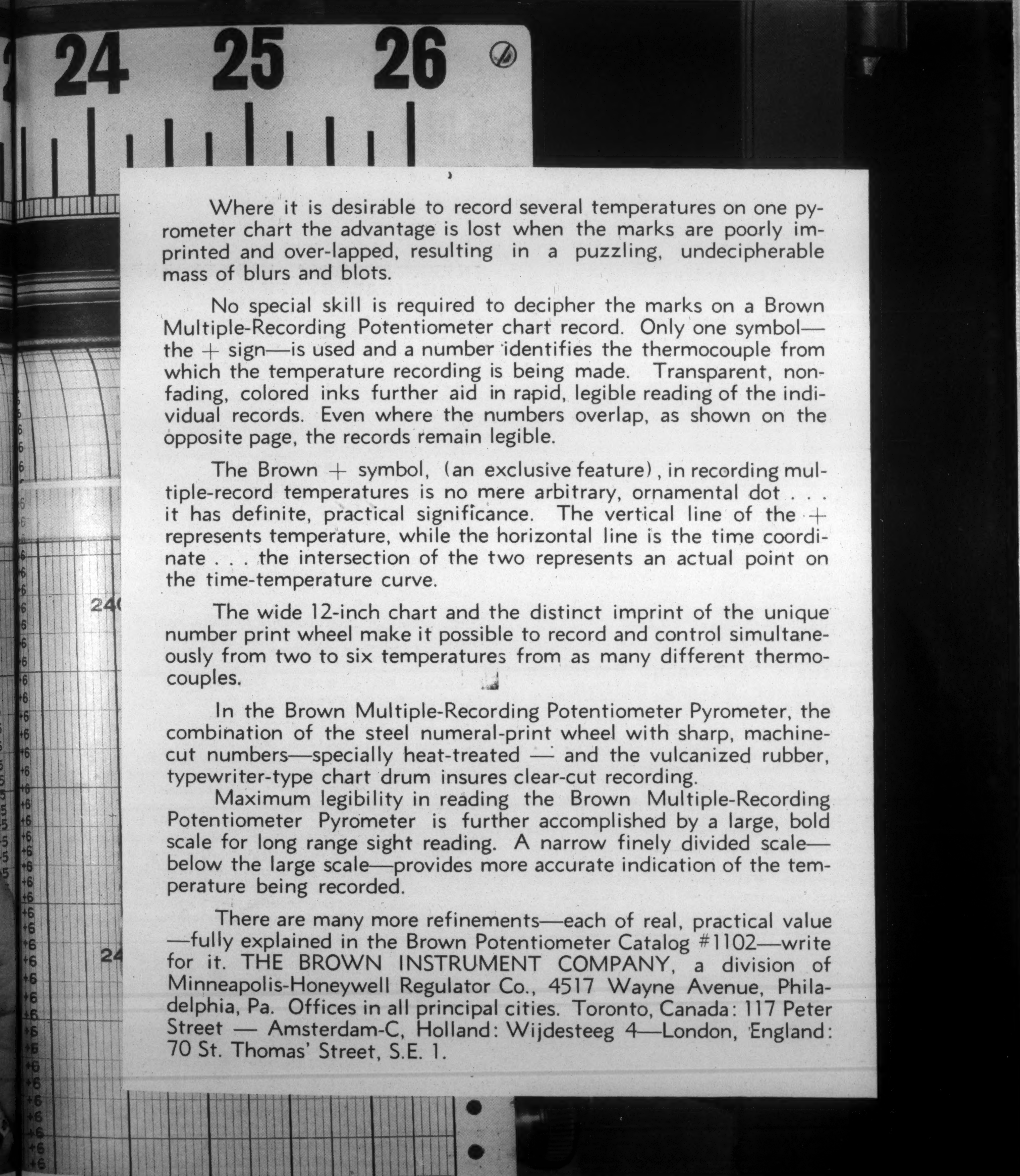

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Current News Items

A.F.A. 1938 Convention in Cleveland

The board of directors of the American Foundrymen's Association, meeting in Chicago, recently accepted the invitation of the Northeastern Ohio Chapter and the city of Cleveland to hold its next convention and exhibition in Cleveland, May 14, 16, 17, 18 and 19, 1938. The last previous convention and exhibition of the American Foundrymen's Association held in Cleveland was in 1930.

The exhibition which will occupy the splendid facilities of the public auditorium and Lakeside exhibition hall will be set up and opened for the benefit of local and neighboring foundrymen on Saturday, May 14. The technical sessions held in the spacious meeting rooms of the public auditorium group of buildings will start Monday morning and conclude with the closing of the exhibition Thursday, May 19.

The central location of the convention city, the prominence of Cleveland as a castings center, with 118 foundries, making a wide diversity of all classes of castings, provides unusual facilities for plant visitation. The region of the lower great lakes is the metal working center of the United States and Cleveland is the focal point of production and use of castings.

Dr. MacKenzie to Present American Exchange Paper Before British Foundry Congress

The American Foundrymen's Association has selected Dr. James T. MacKenzie, chief metallurgist, The American Cast Iron Pipe Co., Birmingham, Ala., to present the association's official exchange paper before the 1938 meeting of the Institute of British Foundrymen. Dr. MacKenzie's paper will review research work on chemical changes of cast iron in cupola melting. He is one of the foremost world authorities on this subject and has been a prominent leader in the activities of the A.F.A. and other technical associations. At the 1937 convention of the A.F.A., Dr. MacKenzie was awarded the Association's J. H. Whiting gold medal for important and practical work in the advancement of gray iron foundry practice.

This paper is one in a series instituted in 1920 to promote the exchange of foundry knowledge between members of the various national associations of America and Europe. Some 300 papers have so far resulted from this arrangement. Further, a series of international foundry congresses has been instituted, being controlled by a committee of representatives of the various national associations including the A.F.A., the Institute of British Foundrymen and the foundry associations of France, Belgium, Italy, Poland, Czechoslovakia, Germany and Holland.

Dr. Coats Receives Medal

The American Electroplaters Society has recently awarded its gold medal prize to Dr. Harry P. Coats of the Firestone Steel Products Co., Akron, Ohio, for presenting what was judged the best paper on electrodeposition during the year 1936. This paper was "Brass Plating for Rubber Adhesion."

INTERNATIONAL NICKEL EXPANDS TECHNICAL STAFF

A. J. Wadhams, vice-president in charge of development and research, the International Nickel Co., Inc., New York, has announced the addition of Wayne Z. Friend to the development and research staff. Mr. Friend will devote most of his time to technical services on corrosion resisting materials, particularly Monel, nickel and inconel. His experience has been principally in the petroleum and natural gas industries and covers the production, refining and marketing of petroleum products, natural gas and liquified petroleum gases.

After being graduated from West Virginia University in 1926 with a master's degree in chemical engineering, Mr. Friend engaged in the production and marketing of natural gasoline with Gasoline Recovery Corp., Charleston, W. Va. During the past seven years he has been associated with Phillips Petroleum Co., and, as chief technologist of the Philgas department of that company at Detroit, has been recently engaged in the industrial application of liquefied petroleum gases to heat-treating requirements of the automotive and other metal industries. He has been active on committees of the American Gas Association, National Bottled Gas Association and American Society for Testing Materials.

Design of Lincoln Gold Medal Approved

The design of the Lincoln Gold Medal, which was accepted by The American Welding Society early this year, for presentation to the author of the best paper on any phase of welding published in the Journal of The American Welding Society during the year November 1936 to October 1937, has been approved. The sculptor has started work on the model.

The Lincoln Gold Medal, offered by J. F. Lincoln, president of The Lincoln Electric Co., Cleveland, is offered as a stimulus to the preparation of worth while contributions to the art of welding. The medal is 2½ in. in diameter and is to be of solid gold. One side of the medal will bear the wording, "Lincoln Gold Medal Award—American Welding Society." This inscription will surround a central figure symbolic of electric welding. The figure will be of an arc welding operator with the arc in operation. The wording on the reverse side of the model will be in relief. Also, lettered in relief on the reverse side will be the name of the individual winning the award, together with the date of presentation.

There are no restrictions as to subject matter of papers eligible to compete for the award. The paper may be on the electric arc process, gas welding, resistance welding, or any other form of welding within the scope of The American Welding Society. The paper may be one read before any sectional meeting of the society or at the general fall meeting. It must, however, be published in the Journal of the Society between November, 1936, and October, 1937. The decision as to the best paper will rest with a committee of the society selected by the president. This committee consists of Col. G. F. Jenks, chairman, K. V. King and F. E. Rogers. The medal will be presented during the annual convention of The American Welding Society in October.

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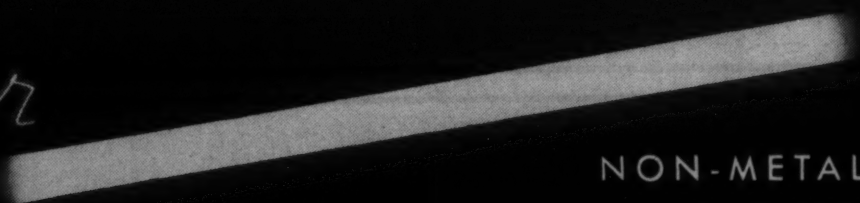

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Fall Technical Foundry Conference To Be Held At Battelle

Sponsored by the American Foundrymen's Association in cooperation with Battelle Memorial Institute, a conference devoted entirely to technical subjects will be held at the Institute laboratories, Columbus, Ohio, Sept. 30 and Oct. 1. While differing in some measure from previous joint conferences of the Association arranged with technical schools, local chapters of its own and other engineering and educational societies, the program, which is reaching completion, will be directed along foundry metalurgical lines. Metallurgists and educators versed in the technical phases of foundry production will deliver papers under the three main headings of steel, non-ferrous and gray cast iron. Attendance and participation of the foremost authorities gives opportunity for a practical short course in these subjects to all interested.

Meetings of various A.F.A. committees are being scheduled for Thursday morning, and the formal program will be held Thursday afternoon and Friday. As an added attraction to those contemplating attendance at the conference, tickets may be reserved for the colorful Ohio State-Purdue game to be held in the Ohio State University stadium Saturday, Oct. 2. The tentative program is as follows:

- SECTION A—STEEL CASTINGS—Presiding, E. W. Campion, president, Bonney Floyd Co., Columbus, Ohio
  - Effects of Alloys on Cast Steels:
    - Discussion leader—Walter Crafts, Union Carbide & Carbon Research Laboratories, Niagara Falls, N. Y.
  - Effects of Aluminum on Physical Properties of Steel Castings:
    - Discussion leader—C. E. Sims, supervising metallurgist, Battelle Memorial Institute, Columbus, Ohio.
- SECTION B—NON-FERROUS CASTINGS—Presiding, Dr. H. W. Gillett, chief technical advisor, Battelle Memorial Institute, Columbus
  - Effects of Chromium in Copper Base Alloys:
    - Discussion leader—Dr. Bruce Gonzer, supervising metallurgist, Battelle Memorial Institute, Columbus, Ohio
  - Melting Methods in the Non-Ferrous Casting Industry:
    - Discussion leader—Harry M. St. John, metallurgist, Detroit Lubricator Co., Detroit
- SECTION C—RELATION OF STRUCTURE TO PROPERTIES OF CAST IRON
  - Cupola Cast Irons:
    - Discussion leader—John W. Bolton, metallurgist, Lukenheimer Co., Cincinnati
  - Electric Furnace Irons:
    - Discussion leader—Richard Schneidewind, University of Michigan, Ann Arbor, Mich.
  - Fundamental Structures of Gray Cast Iron:
    - Discussion leader—Alfred Boyles, metallurgist, Battelle Memorial Institute, Columbus, Ohio

A dinner with short addresses will be held Friday evening at one of the downtown hotels, the noon luncheon that day being staged at the Institute. A special inspection tour of the numerous research laboratories of the Institute will be made Saturday morning. Dr. C. H. Lorig and C. E. Sims of the Institute are in charge of the general local arrangements for the conference.

For those remaining Saturday afternoon, tickets should be reserved as soon as possible through Dr. C. H. Lorig, Battelle Memorial Institute, Columbus, Ohio.

While Columbus has many hotels, those planning to attend are urged to make reservations as soon as possible. Hotels suggested are the Deschler-Wallick, The Neil House, Seneca, Virginia, Fort Hayes and the Chittenden.

A STEEL PRODUCTS MANUAL

Publication of a pamphlet giving definitions of pig iron and ferroalloys has been announced by American Iron and Steel Institute. That pamphlet comprises Section 1 of a projected Steel Products Manual.

The Institute plans to issue from time to time similar sections covering other major classes of products as well as general sections, dealing with manufacturing tolerances, methods of inspection, methods of sampling and chemical analysis, definitions of technical terms and other related information.

Work on this Manual was undertaken by the Institute through its Technical Committee in order to clarify terms and standardize many practices of the industry. During the past decade new iron and steel products have been developed and old ones have been improved. New products have brought new terms and practices into use, and improvements in old products have changed the precise meaning of terms used to describe them, as well as practices used in their manufacture, dealing, and inspection.

Copies of the pamphlet can be secured from American Iron and Steel Institute of 350 Fifth Ave., New York.

Battelle Expands Its Facilities

According to an announcement by Clyde E. Williams, director, Battelle Memorial Institute, Columbus, Ohio, has again expanded its facilities for industrial research. The recent opening of a new four-story building has permitted an extension of its present laboratories and the installation of a complete experimental foundry. The entire ground floor of the new building is given over to the foundry which is two stories high. Laboratories for the ore concentration and coal preparation divisions occupy the third floor, while offices and private laboratories are located on the fourth floor.

The new experimental foundry is equipped for the production of ingots and full sized castings in steel, special alloys, cast or malleable iron and the non-ferrous metals. The melting equipment, which is unusually complete, includes direct arc furnaces, high frequency induction furnaces, a low frequency induction furnace, a cupola and several fuel-fired crucible furnaces. Switch boards and control panels have been provided to make the furnace transformers available for special melting and refining furnaces that may be required for different investigations. This equipment is supplemented by an experimental rolling mill, forge hammers, wire block, swaging machine and heat-treating furnaces so that both wrought and cast materials may be studied in detail. Metallographic, physical testing and chemical laboratories are available for the determination of the physical and chemical properties of metals and alloys.

In addition to the metallurgical laboratories, the Institute is equipped with special laboratories for the study of molding sands, refractories and ceramic products and for the investigation of problems in fuel technology, the treatment of ores and coal and in applied chemistry and industrial physics.

The Institute, through its endowment, supports a broad program of fundamental research in these related fields. Its facilities have been made available to industry under a plan of sponsored research and many problems of technical importance are under investigation for private corporations.

Allegheny Steel Expands

The Allegheny Steel Co. has just put into production at its Brackenridge, Pa., plant a new 25-ton electric furnace, adding 36,000 tons annually to its production capacity on high alloy stainless and corrosion-resisting steels, it was officially announced today.

The company has added 156,000 tons a year to its steel-making capacity in the last 18 mos. Besides installing two electric furnaces in that period, it also put into operation two dismantled open-hearth furnaces which had never been used since their acquisition with other properties in 1929.

This additional capacity was needed to furnish steel for recent increases in Allegheny's finishing capacity, particularly at the West Leechburg plant acquired last year, where the recent installation of additional rolling equipment, annealing and normalizing furnaces, picklers and auxiliary equipment effected a 50 per cent increase in alloy steel strip finishing capacity.

The company has expended approximately $7,000,000 for improvements and extensions since 1929, when the West Penn Steel properties were acquired. The entire expenditure was financed from earnings.

Allegheny Steel Co. now has furnace capacity for producing 500,000 tons of raw steel a yeear, with modern and efficient mills.

Harnischfeger Expands Weld Rod Production

Faced with an ever-increasing demand for greater quantities of "Smootharc Weld Rods," the Harnischfeger Corp. of Milwaukee has recently remodeled its Hercules Steel Casting plant into one of the most modern welding electrode factories in the country. There the extensive P&H electrode research laboratories are already set up and almost the entire plant will be devoted to the manufacture and improvement of Smootharc welding wire. Previously manufactured in the National Ave. plant, welding electrodes have for years been well known throughout the welding industry.

Manufacturers' Literature

Sulphur Determinator

An illustrated folder describes the Leco Sulphur Determinator, claimed to permit extremely accurate sulphur determinations within five minutes. Laboratory Equipment Corp., St. Joseph, Mich. (B 1232)

Temperature Measurement

Thermocouple pyrometers, resistance thermometers, optical pyrometers and Rayotube pyrometers are described in Broadside N-33, which also illustrates Micromax and other L & N pyrometer instruments. Leeds and Northrup Co., Philadelphia, Pa. (B 1233)

Oil Burners

ZERO low pressure oil burners are versatile, afford perfect atomization and permit use of all grades of fuel oil, according to Bulletin No. 45. Standard Fuel Engineering Co., Detroit, Mich. (B 1234)

Insulcrete

The properties and uses of this lightweight cellular insulating refractory concrete, used for direct exposure to temperatures up to 2500 deg. F., are given. Quigley Co., Inc., New York. (B 1235)

Inhibitors

"Pickling Steel with Modern Inhibitors" is the title of this informative 32 page technical publication, which covers theory, procedure, equipment and testing of inhibitors, with particular reference to Acitrol 100. E. F. Houghton & Co., Philadelphia, Pa. (B 1236)

Contour Sawing

A handbook on contour sawing is offered by the manufacturers of the DOALL Metalmaster which, it is claimed, offers heavy duty precision machining and finishing of metals up to SAE 1090. Continental Machine Specialties, Minneapolis, Minn. (B 1237)

Gas Furnaces in the Automotive Industry

Applications of various SC furnaces for annealing, hardening, carburizing, malleabilizing, forge-heating and other operations in the automotive industry are illustrated. Surface Combustion Corporation, Toledo, Ohio. (1238)

Hard Facing

This comprehensive 100 page, well-indexed, illustrated catalog describes the use of Haynes Stellite, Hascrome and Haystellite for hard-facing several materials in a variety of industries. Haynes Stellite Co., Kokomo, Ind. (B 1239)

Ampco Metal

Engineering data sheet No. 43 discusses unusual applications of Ampco Metal in industry. Ampco Metal, Inc., Milwaukee, Wis. (B 1240)

Refractory Concrete

P. B. Sillimanite Hydrocast is described as a super-refractory useful for lining and other applications in industrial furnaces. Chas. Taylor Sons Co., Cincinnati, Ohio. (B 1241)

Heat and Corrosion Resisting Alloys

Amsco Ni-Cr-Fe alloys are successfully used in scores of applications requiring excellent resistance to high temperatures and corrosive chemicals, according to this folder of the American Manganese Steel Co., Chicago Heights, Ill. (B 1242)

Heat Resisting Alloy Castings

Data on applications are given in a bulletin dealing with installations where strength at high temperatures must be provided. Ohio Steel Foundry Co., Springfield, Ohio. (B 1243)

Ladle Additions

Bar-Flux, a patented barium compound for use in acid or basic steel for ingots or castings, is featured in a booklet. Grades for use with non-ferrous metals. Si-Lux Co., Pittsburgh, Pa. (B 1244)

Combustion Safeguard

The Flame-otrol, a gas burner safety device, is designed to shut off the gas and prevent explosions in case of flame failure. Construction and operation described. Wheelco Instruments Co., Chicago, Ill. (B 1245)

Beryllium-Copper

This heat-treatable alloy is corrosion-resistant, non-rusting, non-sparking and non-magnetic and possesses excellent electrical, tensile and fatigue properties. Composition, properties and applications are given in this catalog. Riverside Metal Co., Riverside, N. J. (B 1246)

Aluminum Flux

A pamphlet entitled "Look into the Ladle" describes how this flux supplies the chemical and metallurgical needs in the melting of aluminum. The Maluminum Co., Indianapolis, Ind. (B 1247)

Modern Gathmann Methods

A leaflet illustrates some of these methods and tells why they are vital to makers and users of steel. The Gathmann Engineering Co., Baltimore, Md. (B 1248)

High Temperature Cement

The applications and engineering properties of Sonittep high temperature cement, claimed to prolong refractory life 15 to 30%, are given in this folder. George F. Pettinos, Inc., Philadelphia, Pa. (B 1249)

Non-Ferrous Ingots

Ajax 7 point ingots have 7 outstanding advantages, according to this bulletin, which gives the A. S. T. M. specifications and examples of uses of bronzes, brasses and high lead alloys. Ajax Metal Co., Philadelphia, Pa. (B 1250)

Economical Cleaning of Castings

Whiting roller-bearing tumbling mills provide quick, low-cost dust-free cleaning of castings, according to catalog No. 217, which also gives detailed description of equipment and drives. Whiting Corporation, Harvey, Ill. (B 1251)

Reducing Oxidation and Decarburization in Heat Treating

R-S Furnace Pressure Control for oil and gas-fired heat treating operations improves uniformity by effecting even thermal distribution, balanced combustion and a minimum of surface alteration. R-S Products Corporation, Philadelphia, Pa. (B 1252)

Comparison Microscope

With the Busch comparison microscope the observer sees through a single eyepiece the magnified images of specimen and standard side by side without any separation. George Scheer Co., Inc., New York. (B 1253)

Checker Brick

Technical data and uses of Superior open hearth checker brick, which is claimed to produce a solid stable checker volume, absolutely straight flues and fuel economy through interlocking construction, are given. William M. Bailey Co., Pittsburgh, Pa. (B 1254)

Hot Galvanizing

"A Guide to Longer Life for Iron and Steel Products" is the title of this interesting pamphlet giving the history, applications and advantages of hot galvanizing. American Hot Dip Galvanizers Assoc. Inc., Pittsburgh, Pa. (B 1255)

Muffle Furnaces

Bulletin HD 537 describes Hevi Duty Laboratory Muffle Furnace HD-92 (with transformer and rheostat) claimed to be more ruggedly constructed for longer operation at higher temperatures. Hevi Duty Electric Co., Milwaukee, Wis. (B 1256)

Temperature and Pressure Instruments

This new 56 page catalog (No. 1060C) gives complete structural, installation and operating data for TAG indicating and recording temperature and pressure instruments. C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. (B 1257)

Silicate Cements for Acid Resistance

Reprints of a paper by F. D. Snell and H. Farkas on "Quick-setting Silicate of Soda Cements for Acid-proof Tank and Tower Construction" are offered by U. S. Stoneware Co., Akron, Ohio. (B 1258)

Charger for Small Cupolas

The Tiger Skip-Hoist Cupola charger, claimed to make possible low cost hot metal from small cupolas with better control and easier operation, is described in folder of the Whiting Corporation, Harvey, Ill. (B 1259)

Microscopes and Auxiliary Equipment

Toolmakers' wide field binocular, junior binocular, and shop microscopes, together with Brinell and tube microscopes and optical aids are described and illustrated in catalog D-22 of Bausch & Lomb Optical Co., Rochester, N. Y. (B 1260)

Metallurgical Testing Equipment

Louis Schopper metal testing machines and appliances for measuring tensile, compression or torsional strength, elongation, hardness, impact resistance, etc., are described in catalog 390. Testing Machines, Inc., New York, N. Y. (B 1261)

MANUFACTURERS' LITERATURE

Measuring the Flow of Air and Gases

Flow meters for measuring the flow of air and gases of all kinds to obtain control of gas burning operations and carburizing are featured in a leaflet which contains a description and diagrams of these instruments. American Gas Furnace Co., Elizabeth, N. J. (B 1262)

Wear Tester

The Taber Abraser for measuring the wear resistance, adhesion and rub-off qualities of finishes is the subject of a well-illustrated booklet. Taber Instrument Co., North Tonawanda, N. Y. (B 1263)

Blue Book of Thermometals

Complete mechanical, thermal and electrical characteristics for all standard types of Wilco thermometals are included in this book which contains a review of properties and applications of modern thermostatic bimetals. H. A. Wilson Co., Newark, N. J. (B 1264)

Die Casting Equipment and Alloys

A bulletin, covering lubricators, die castings and dies, designs and casting machines and Kipp Air Tools, describes as a complete die casting service the products of the Madison-Kipp Corp., Madison, Wis. (B 1265)

Refractory

Thermal Alumina which can be used for working temperatures up to 1950 deg. C. and is suitable for the fusion of metals, alloys and alkalies while having a slow rate of reaction with concentrated alkaline solutions, fused salts or boiling concentrated sulphuric acid, according to the manufacturer, is the subject of an illustrated leaflet of The Thermal Syndicate, Ltd., Brooklyn, N. Y. (B 1266)

Testing Machines

The Southwark-Emery line of testing equipment is featured in a fully illustrated bulletin, containing charts, curves and technical data. Baldwin-Southwark Corp., Philadelphia, Pa. (B 1267)

Automatic Optical Pyrometer

Bulletin No. 91-1 is devoted to the Optimatic sighting tube, the power supply unit and the instruments which comprise the Optimatic System for measuring surface temperatures of hot bodies in motion or at rest. The Brown Instrument Co., Philadelphia, Pa. (B 1268)

Buffs and Compositions

Bulletin No. BC-104 contains pictures of the various types of buffs and compositions as well as a description of their uses. Hanson-Van Winkle-Munning Co., Matawan, N. J. (B 1269)

Ground Shafting

Turned, ground and polished shafting and small diameter drawn, ground and polished bars are discussed in a leaflet illustrating the modern production methods used in manufacturing them. Bliss & Laughlin, Inc., Harvey, Ill. (B 1270)

Retorts for Gas Carburizing

Rotary and stationary retorts are discussed in a leaflet which gives different analyses which may be used for varying conditions. The Calorizing Co., Pittsburgh, Pa. (B 1271)

Spring Making

A handbook of modern spring engineering for users and designers of springs, containing useful data as well as illustrations, diagrams and engineering tables, has been issued by Barnes-Gibson-Raymond, Detroit, Mich. (B 1272)

Air Drawing

It is claimed that this company's air drawing furnaces produce uniform Brinell hardness and grain structure. Diagrams and description. General Combustion Corp., Chicago, Ill. (B 1273)

Testing Machine

This machine, for tensile, transverse and compression testing (capacity 30,000 lbs.) is the subject of a leaflet of the Detroit Testing Machine Co., Detroit, Mich. (B 1274)

Adachrome

This plastic chrome cement, claimed to hold its component materials in suspension indefinitely, is described in a pamphlet. Botfield Refractories Co., Philadelphia, Pa. (B 1275)

Hy-Speed Case

It is claimed that this case has a sufficiently low melting point so that it can be used from 900 to 1100° F. on high speed tools. A. F. Holden Co., New Haven, Conn. (B 1276)

Steel in Forged Sections

Hardness conversion tables and tensile property tables are included in this catalog which also gives specific effects of alloying elements in steel. Heppenstall Co., Pittsburgh, Pa. (B 1277)

Corrosion and Heat-Resisting Steels

Enduro Types HCN, NC-3 and HC are described in a leaflet containing analyses, physical properties, instructions for working and applications. Republic Steel Corp., Massillon, O. (B 1278)

Insulating Brick

Physical properties of the new JM-20 insulating brick, designed for use behind refractory walls in furnaces, are given in a leaflet featuring a table of heat losses transmitted through fire brick walls bare and insulated with JM-20 brick. Johns-Manville, New York, N. Y. (B 1279)

Zinc Alloy Die Castings

This supplement of "A Visual Report of Progress" brings the progress being made in the die casting industry up to date. The New Jersey Zinc Co., New York, N. Y. (B 1280)

Thermalloy Castings

Information on Ni-Cr castings for heat and corrosion resistance which are X-ray inspected is given in a bulletin of the Electro Alloys Co., Elyria, O. (B 1281)

Carbide Tools and Blanks

Catalog M-37 gives complete data on sizes and prices of Carboloy blanks, and specifications and prices of Carboloy standard completely-ground and unground tools. Carboloy Co., Inc., Detroit, Mich. (B 1282)

Handling Heat

Alundum and Crystolon refractories for furnace and kiln linings and parts resist spalling, warpage, deformation under load and are of uniform dimensions according to publication No. 5 of the Norton Company, Worcester, Mass. (B 1283)

Dehumidifiers

Lectrodryer systems, employing Activated Alumina for drying air and other gases by adsorption, are described in this well illustrated booklet by the Pittsburgh Lectrodryer Corp., Pittsburgh, Pa. (B 1284)

Metallographic Polishing Machines

Direct drive (no belt or friction drive) polishing machines are described as providing operating smoothness, sturdiness and flexibility in this bulletin of the Cincinnati Electrical Tool Co., Cincinnati, Ohio. (B 1285)

Heat Treating Furnaces

Electric and fuel fired furnaces for annealing, forging, hardening and die casting, and burner accessories are illustrated in Bulletin No. 39. W. S. Rockwell Co., New York. (B 1286)

Corrosion Resisting Equipment

New catalog of equipment made exclusively to handle corrosive solutions gives complete data, including sizes, capacities and engineering information, on materials, parts, containers, etc. Duriron Company, Inc., Dayton, Ohio. (B 1287)

Non-Ferrous Alloy Data Sheet

Exhaustive compilation of composition and mechanical and physical properties of 43 Revere bronze, brass and copper-nickel alloys, in tabular form. Revere Copper and Brass, Inc., New York. (B 1288)

Ladle Pouring Brick

Ironton ladle pouring bricks for hand, bull and crane ladles are claimed to reduce losses caused by slag entering the molds. Ironton Fire Brick Co., Ironton, Ohio. (B 1289)

Furnace Insulation

Thermal Vermiculite insulating products for temperatures up to 2200 deg. F. are described in a leaflet issued by Thermal Products Corporation, Pittsburgh, Pa. (B 1290)

Furnaces and Foundry Accessories

Bulletin No. 54 pictures various Fisher Crucible Melting Furnaces, as well as a variety of essential foundry accessories. Fisher Furnace Co., Chicago, Ill. (B 1291)

New Portable Pyrometer

Details of construction and operation of the Pyramid Pyrometer, which features quick calibration, flexible arm, and pistol type grip with conveniently visible dial, are given in this leaflet. Tamms Silica Co., Chicago, Ill. (B 1292)

Precision Valve for Furnaces

The improved Mehler precision valve, claimed to afford extremely fine regulation of fuel flow, is introduced to the general furnace field. Operating data are given. Mehler, Inc., Pittsburgh, Pa. (B 1293)

MANUFACTURERS' LITERATURE

Midvaloy No. 77

An unusual oil hardening alloy steel for use in ball races, balls and bearings, taps and tapper taps, etc., is described in a leaflet of The Midvale Co., Nicetown, Philadelphia, Pa. (B 1356)

Everdur

This metal is a high strength, non-magnetic, non-sparking alloy of the solid solution type composed of copper, silicon and other controlled elements, according to this illustrated leaflet. American Brass Co., Waterbury, Conn. (B 1357)

Properties of OFHC Copper

An attractive booklet contains reprints of three papers relating to the above subject. United States Metals Refinining Co., New York, N. Y. (B 1358)

Sixteen Sins of the Cleaning Room

Are listed in a circular for convenience in checking on cleaning rooms. Great Lakes Foundry Sand Co., Detroit, Mich. (B 1359)

Cataloy Lead Bronze

This process which is guaranteed to perfectly combine copper and lead in your own plant is described in literature from Cataloy, Los Angeles, Cal. (B 1360)

Vanadium Steels

Various of these steels for locomotive and car construction are described in a booklet. Vanadium Corp., of America, New York, N. Y. (B 1361)

Alloy Castings

Corrosion-resistant and stainless steel castings are the subject of a new booklet. Michiana Products Corp., Michigan City, Ind. (B 1362)

Chain and Belt Conveyors

Bulletin 1-B discusses conveyors for use at high temperature. Michigan Steel Casting Co., Detroit, Mich. (B 1363)

Silico-Manganese Spring Steel

Extreme care is taken in processing this steel to avoid imperfection, according to the manufacturer. Illustrated. Bethlehem Steel, Bethlehem, Pa. (B 1364)

Beryllium Copper

Data on properties, heat treatment and fabrication of this copper alloy are given in an illustrated leaflet of The Beryllium Corp. of Penna., Reading, Pa. (B 1365)

Air Setting Bond for Firebrick

Wal-Set, for bonding firebrick and other refractory materials, is the subject of an illustrated pamphlet. Wahl Refractory Products Co., Fremont, O. (B 1366)

Lithoform

This non-inflammable liquid makes paint stick to galvanized iron and other metals that shed paint. American Chemical Paint Co., Ambler, Pa. (B 1367)

Low Voltage Generators

Advanced features of design permitting light weight, compact size, more efficient performance and continuous operation are claimed for these generators. Columbia Electric Mfg. Co., Cleveland, O. (B 1368)

Heat and Acid Resisting Castings

Bulletin No. 21 lists the most popular analyses of Standard-Alloy together with safe workable loads at different temperatures. The Standard Alloy Co., Cleveland, O. (B 1369)

High Frequency Electric Power Converters

High frequency electric converters for use in conjunction with numerous industrial induction heating applications are described. Lepel High Frequency Laboratories, Inc., New York, N. Y. (B 1370)

Aerocase

Booklet on this subject. Illustrations, curve charts, tables. American Cyanamid and Chemical Corp., New York, N. Y. (B 1371)

Electromet Review

This publication, whose purpose is to bring "News and Views of Alloy Steels and Irons" to the reader, contains interesting items. Electro Metallurgical Co., New York, N. Y. (B 1372)

Control of Furnace Atmosphere

Two bulletins devoted to a description of "Certain Curtain Control of Atmosphere"; and to furnaces for pre-heating and hardening high-speed steel have been issued by C. I. Hayes, Inc., Providence, R. I. (B 1373)

Improved Pot Hardening Furnaces

A leaflet devoted to these furnaces has been issued by the American Gas Furnace Co., Elizabeth, N. J. (B 1374)

Speed Case Steels

Data on the three new types of this company's "Speed Case" steel in the higher carbon ranges are offered by The Monarch Steel Co., Indianapolis, Ind. (B 1375)

Superficial Hardness Tester

Catalog Supplement RS-3 is devoted to this hardness tester, intended for tests where only very shallow penetration is possible. Wilson Mechanical Instrument Co., New York, N. Y. (B 1376)

Vapor-Spray-Vapor Detrex Degreaser

This special machine equipped with a monorail conveyor is described in literature from the Detroit Rex Products Co., Detroit, Mich. (B 1377)

Stainless Steel Castings

An attractive booklet contains useful information on the subject. Typical analyses, characteristics and suggested uses are listed. Joseph T. Ryerson & Son, Inc., Chicago, Ill. (B 1378)

Turbo-Compressor Data Book

This data Book No. 107 gives accurate information on the characteristics of turbo blowers and exhausters. The Spencer Turbine Co., Hartford, Conn. (B 1379)

Konik

Data on this steel's physical properties, corrosion resistance and working are offered by the Continental Steel Corp., Kokomo, Ind. (B 1380)

Modern Metal Finishing

This bulletin, issued periodically, conducts a Questions and Answers department for metal treaters. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. (B 1381)

3300 Deg. Super Refractory

An illustrated catalog devoted to "Shamva" Mullite contains information regarding its background, characteristics and uses. Mullite Refractories Co., Shelton, Conn. (B 1382)

Hi-Steel

Information concerning chemical composition, physical properties and corrosion resistance of this steel is offered by the Inland Steel Company, Chicago, Ill. (B 1383)

Tool Steels

A looseleaf handbook contains detailed instructions for forging, annealing, hardening and tempering each grade of steel with the resulting hardnesses; general working instructions, etc. Crucible Steel Co. of America, New York, N. Y. (B 1384)

Radium for Industrial Radiography

This article written by R. A. Gezelius and C. W. Briggs, containing interesting and important information on the subject, is published in handy booklet form. Radium Chemicals Co., Inc., New York, N. Y. (B 1385)

Weld It Well!

This colorful bulletin, No. HW-4, covers the complete line of P&H-Hansen arc welders from 50 to 800-ampere units, as well as welding fixtures and accessories. Generously illustrated. Harnischfeger Corp., Milwaukee, Wis. (B 1386)

Microscopes and Accessories

General information is given, and various equipments are illustrated and described in the Zeiss catalog. Carl Zeiss, Inc., New York, N. Y. (B 1387)

Controlling Structural Composition

The Micro-"Metalix" apparatus, affording a method of testing non-destructively the structural composition of light metal alloys and controlling this in the various stages of manufacture is described in a leaflet of the Philips Metalix Corp., Mt. Vernon, N. Y. (B 1388)

Hardening High Speed Steel

Bulletin No. 1012-3 is devoted to this company's Diamond block method of control for hardening high speed steel in a neutral, or other atmosphere. The Sentry Co., Foxboro, Mass. (B 1389)

New Temperature Controller

Smooth proportional valve action, combined with the potentiometer principle of temperature control, is provided in the new Fulscope Micromax Air-operated Potentiometer Controller, produced by Taylor in conjunction with Leeds and Northrup and described in Catalog 101 R. Taylor Instrument Cos., Rochester, N. Y. (B 1390)

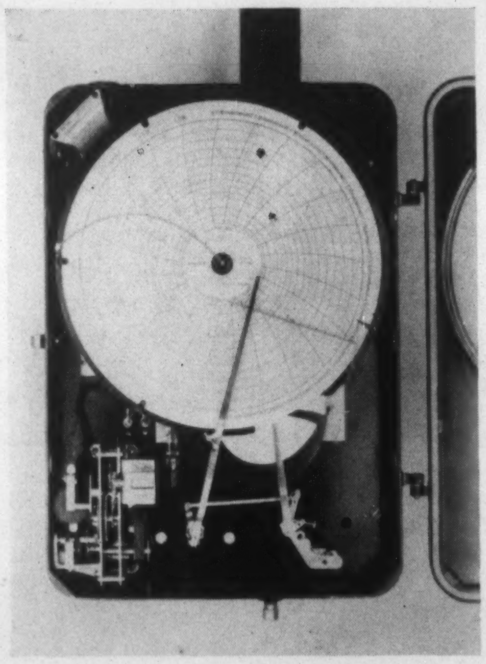
Metallographic Polishing Machine

This machine, which is equipped with a variable speed motor giving a range of speeds between 300 and 3000 RPM, offering a new standard of efficiency according to its manufacturers, is the subject of a leaflet of The Cincinnati Electrical Tool Co., Cincinnati, O. (B 1391)

New Equipment and Materials

Flow Meter Electric Integrator

The new electric integrator developed by The Bristol Co., Waterbury, Conn., totalizes flow once every 15 sec. Bristol's mechanical and electric flow meters, for measuring the flow of a gas or non-viscous liquid through a closed line, are now equipped with this type of integrator.



A flat disc cam, shown in the illustration partially concealed by the chart plate of the instrument, is specially designed to coincide with the flow law, so that it mechanically computes the square root of the differential pressure across an orifice plate or venturi tube constriction in a pipe line, at 15-sec. intervals. The values obtained are totalized by means of a counter and are indicated on a six-figure integrator dial.

In the illustration the integrating mechanism is shown to the upper right of the cam. It consists essentially of a continuously running telechron motor, which operates a counter through a train of gears. These are engaged and disengaged by means of a mercury switch and magnet. The cam rider, which is connected through a link to the recorder pen arm, operates the mercury switch in one direction while on the cam and allows it to return to its original position when off the cam. In the latter position the magnet is energized so that the gears are meshed and the integrator is totalizing the computations of flow. Thus, while the telechron motor runs continuously, it operates the totalizer counter only when the gears through the integrator are meshed. A copy of Bristol's new Catalog No. 1050, which describes this integrator, may be obtained upon request.

A "Lo-Water" Cut-off

The Minneapolis-Honeywell "Lo-Water Cut-off" is now available at a new low price, yet it has many new and vital features which include quick installation, flexible mounting, alarm or signal circuit, easily accessible and improved mercury switch. Boiler protection is essential for steam and vapor systems. This new low pressure Lo-Water Cut-off can be installed according to the ASME boiler code—or in the gage glass fittings of the boiler with the resulting saving in labor and material. The Lo-Water Cut-off is designed to fit standard ½-in. gage glass openings.

An unusual installation feature of this cut-off is that the lower fitting may be readily removed if there is not enough room to swing the entire assembly. A copper tube between mountings can be cut to accommodate various center dimensions and easily shaped to allow for any slight misalignment. The switching mechanism may be removed, without dismounting the instrument from the boiler.

This Lo-Water Cut-off is designed for use with pressures not exceeding 10 lbs. per sq. in. The electrical rating is 10 amps. at 110 volts and 5 amps. at 220 volts with motor rating of ¾ H.P.R.I. and ¼ H.P.S.P. A manual reset is also obtainable at slight additional cost to necessitate manual attention to restore burner operation. The Lo-Water Cut-off is manufactured by the Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., with branch and distributing offices everywhere.

New Alloy Steel Rod

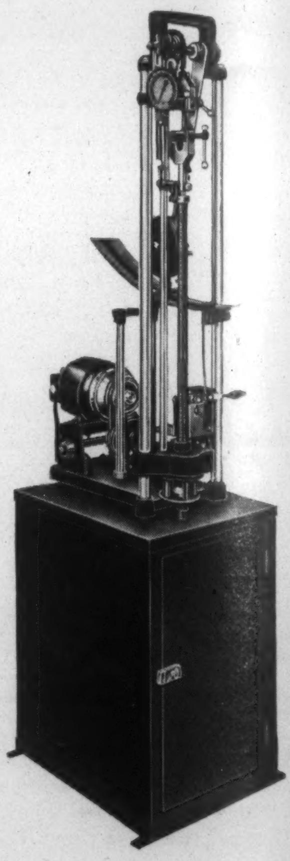
The Air Reduction Sales Co., New York, has developed a new gas welding rod, the "Airco No. 1 High Ductility Alloy Steel." It has been designed to meet the present-day demand for increased ductility and general improvement in quality of both single and multi-layer steel welds. An outstanding feature of the Airco No. 1 Rod is its ability to withstand considerable heating without burning. In this important respect it is in a class by itself. Every test has shown it to be the ideal rod on which to standardize for all steel pipe and plate welding, both light and heavy.

An examination of the physical characteristics of the new rod discloses the following salient facts:

1.—Free bend ductilities of single layer welds, range from 20 to 30 per cent depending upon the composition of the steel. 2.—Free bend ductilities of multi-layer welds, up to 40 per cent on low and medium carbon steels. 3.—Ultimate tensile strengths in excess of 60,000 lb. per sq. in. 4.—Specific gravity of welds, 7.80—7.86. 5.—Charpy impact values on keyhole notched specimens at 70 deg. F., from 15 to 30 ft. lb. 6.—Rockwell hardness of weld metal from B60 to B85, depending on carbon content of base metal and type of weld.

Universal Steel Tester

The Amthor Testing Instrument Co. of Brooklyn announces the introduction of a New Universal Tensile Strength Tester. This tester is designed to conform with standard specifications for determining simultaneously the tensile strength and elongation of wire, cordage, rubber, paper, and other flat materials.



The tester operates on the pendulum principle and has a maximum capacity of 300 lbs. The 24-inch radius quadrant has a three-range scale on which the load is directly indicated by the pendulum arm. This three-scale arrangement provides a more open reading on low strength materials. Readings remain fixed at the exact breaking point on the load scale. An elongated dial indicator shows readings in both inches and per cent for all materials except rubber. Readings on the dial indicator remain fixed until reset to zero. There is a special elongation scale provided for rubber specimens.

The tester is furnished with three standard pulling speeds of 3, 12, 20 in. per min. Power on the pulling clamp is produced by a 1/6th h.p. constant speed motor. Proper clamps are provided for the materials to be tested.

The tester occupies a floor space of 18 x 22 in. and stands 74 in. high. No special installation is necessary. A complete, detailed and illustrated circular will be sent on request.

A Portable C-SiC Thermocouple for Liquid Steel

The Fitterer Pyrometer Co., P. O. Box 7254, Pittsburgh, has a pyrometer which is claimed to measure temperatures up to 1800 deg. C. It was originally described before the iron and steel division of the American Institute of Mining and Metallurgical Engineers in 1933 (Vol. 105, 1933, page 290) by the inventor, G. R. Fitterer. It is a C-SiC thermocouple designed especially for measuring the temperature of liquid steel. It is stated that numerous installations have been made, all of which are successfully cperating daily.

The most recent development in the C-SiC couple is the portable unit, which is inserted through the wicket hole of the open-hearth or other furnace door, and immersed in the steel to a depth of 6 to 8 in. at a point 2½ ft. from the front wall. This type can be made up to 8 ft. in length at the present time. It is telescopic in nature and the total length of an 8-ft. couple when extended is about 15 ft.

In operating this device, the tip of the couple (or hot junction) is preheated by placing it just above the slag surface where it is held until the potentiometer records a temperature of about 2800 deg. F. This requires less than 3 min. At this time the tip is immersed through the slag and into the metal. A period of about 1 min. is required for the couple to reach a condition of thermal equilibrium with the metal, at which time the indicated temperature remains constant. Some readings have been made within 20 sec. after immersion.

The total operation requires about 4 min., after which the couple is removed from the furnace, its leg folded up, and the entire equipment, weighing some 50 lb., carried away. This factor of portability is highly desirable since the instrument may be removed in case it interferes with other operations; also, one instrument will serve several furnaces.

Another interesting feature of this type of couple is that simultaneously with the determination of ladle temperature, the freezing point of the steel can also be determined. The couple is preheated to about 2100 deg. F. prior to immersion. Because this temperature is below the melting point of steel, some 25 lb. of metal freezes on the tip of the couple. Then, if 10-sec. readings are taken as the surrounding metal heats the frozen material to the temperature of the surrounding liquid, it is noticed that at a given time the temperature increase per 10-sec. interval suddenly rises from 40 to 100 deg. It is at this point that the metal has become semi-liquid and dropped off the end of the couple, thus allowing the heat from the surrounding liquid to reach the tip. The temperature at this "halt-point" is taken as the apparent freezing point.

A period of not more than 3½ min. is required for this type of couple to reach thermal equilibrium. The time at which the melting point of the steel is reached is within about 2 min. after immersion.

All thermocouples of this type are now furnished with replaceable graphite tips or immersing ends. This is the part that wears out in service and may be replaced in a few minutes. The insertion of a new tip does not require a new calibration chart. The life of the replaceable tip varies with the steels in which it is immersed, so that it is rather difficult to give an average length of service.

This thermo-couple is claimed to be a true thermo-electric device, which has the following properties:

(1) A linear variation of millivolts to temperature.

(2) Reproductability, i.e., different couples have similar calibration lines.

(3) Useful from very low to very high temperatures, up to 3600 deg. F. In the original technical paper 3270 deg. F. was the maximum temperature claimed.

(4) The largest thermo-electric power of any commercial thermocouple to date; it develops thirty times the millivolts of the Pt-PtR couple at any temperature.

(5) Chemical stability; gases such as CO and CO_2 have no effect on its calibration.

An Inspector's Lantern

A new carbide lantern has recently been announced by the National Carbide Corp., 60 East 42nd St., New York, designed for use by railroads, municipalities and associated industries. The lantern is the result of years of manufacturing experience and study of field conditions to develop the ideal light-weight carbide lantern. It is equipped with a safety flame protector, heat resisting glass lens and porcelain burner tips. Of extremely light weight to meet the exacting requirements of car inspectors, the lantern can be used for 8 hrs. on one charge of carbide.

Additional features include an insulated handle to protect the workman against third rails and any exposed electric equipment, positive water feed control and a patented rear light of any desired color. To insure long service and prevent corrosion, brass has been used in making the water and carbide chambers.

A novel and convenient feature of the lantern is the treatment of the threads joining the upper part of the lantern with the carbide chamber. In order to prevent damage when shaking out the contents of the carbide chamber, the female threads have been inverted and placed inside the chamber.

Magnesium Die Castings

The Doehler Die Casting Co., 386 Fourth Ave., New York, has just announced the addition of magnesium base alloys to their list of die casting alloys which includes tin, lead, zinc, aluminum and copper base alloys.

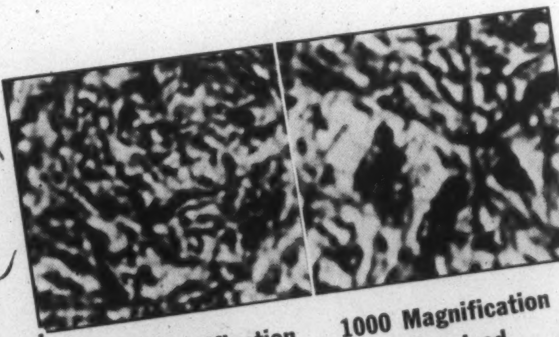
Magnesium is the featherweight of the known commercial metals. It is fully one-third lighter than aluminum and on the weight unit basis, is the strongest metal available.

The Doehler company has standardized on three magnesium alloys having a tensile strength of up to 35,000 lbs. per sq. in., and an elongation of up to 10 per cent, although other alloys are also available to meet special service requirements.

The addition of magnesium to the list of available die casting alloys combines the labor saving feature of the die casting process with the weight saving feature of magnesium.

Calling Designers and Production Heads to CHAPMANIZING...

the money-making, time-saving way to surface-harden steels

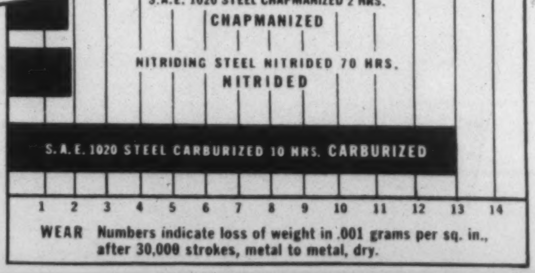


Note difference in micro-structure between Chapmanized and carburized steel. Chapmanized structure is close-packed, without the needle-like formation of the carburized structure. This is *visible proof* that Chapmanized steel is *not* brittle.

Cost and time studies repeatedly prove the dollar-sense of this exclusive surface-hardening process.

Only four hours of Chapmanizing gives inexpensive free-machining steels the wearability of costly nitrided alloys... imparts a tough yet ductile case, from .002″ to .035″ deep, that won't crack, chip, or flake.

What's more, Chapmanizing won't deform intricate parts... they can be forged, stamped, rolled, cast, or finish-ground. And the process can be controlled, charge after charge, to meet specifications exactly.



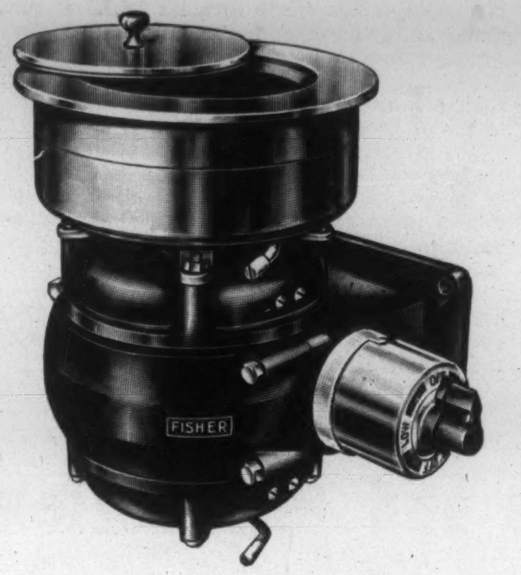
Chapmanizing is revolutionizing many phases of steel treatment — yet it won't upset your hardening set-up for a moment. Use your present equipment, plus the Chapmanizer Unit, installed on contract. No capital investment at all. Write for proof of what this process is doing for plants like your own. And ask for a copy of the new illustrated book that gives complete engineering information.

CHAPMANIZING

THE CHAPMAN VALVE MANUFACTURING CO.
INDIAN ORCHARD, MASSACHUSETTS

Improved Polisher

An improved, small size, motor-driven polisher for metallographic specimens has been put on the market by Fisher Scientific Co., Pittsburgh. This new polisher permits the use of two speeds, 1150 r.p.m. and 550 r.p.m., both of which are slower than the old models. These



speeds are obtained by the use of a two-speed, ¼ h.p. motor directly connected, there being no rheostat employed.

The motor is mounted in a cast-iron housing which also serves as a bracket for fastening the polisher on to the wall or the side of a work bench, or it can be mounted beneath a bench with the polisher projecting through a hole in the top.

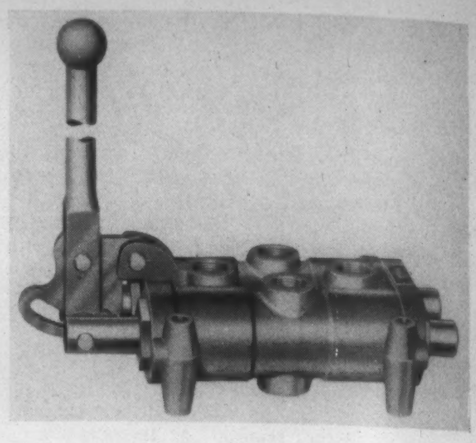
This polisher has a cast aluminum bowl made in two pieces; the upper half completely surrounds and extends above the polishing head and turns the splash down into the bowl. When it is removed, the polishing head is accessible and unencumbered so that polishing cloths can be easily changed. The lower portion of the aluminum bowl has a drain and a cock for drawing off the polishing liquid which is caught in the bowl. An aluminum lid protects the disc from dust when the machine is not in use and it also keeps the cloth from drying out.

A 6-in., hard rubber polishing head, mounted on a cast-iron shaft, fits the shaft of the motor and is held securely with a setscrew. It has a groove along the edge for holding the polishing cloth which is clamped securely into this groove by a special counter-balanced clamping device which can be quickly attached or removed. Exchange of heads is also a quick and easy operation.

While this machine is called a "polisher," it is also used for grinding, for which purpose a cast-iron grinding head is available for $8.50.

New Hydraulic Valve

The design of this new valve, manufactured by C. B. Hunt & Son's Co., of Salem, Ohio, embodies the same no metal-to-metal wear principle and minimum of moving parts as characterizes this company's well known line of "Quick-As-Wink" air control valves. The illustration shows a bronze forged housing valve, hand lever operated, for 4-way operation; also built for 2-way and 3-way. Made in ½, ¾ and 1 in. sizes, in two styles, for 1000 lbs. working pressure and for 2000 lbs. working pressure. The bronze forgings used as housings are among the largest bronze forgings ever made. The employment of the dropped forged bronze housing with its high physical strength affords an additional factor for long life with water or corrosive fluids.



In the "Quick-As-Wink" valving principle, the valving operation is accomplished in the 2-way valves by only one moving part; in the 3-way and 4-way valves by coincident motion of two valve bodies or plungers. The valve bodies or plungers are made of stainless steel. These are "free-floating" in special packings, avoiding metal-to-metal contact. Balanced port action in conjunction with the valving ring and the no metal-to-metal contact is claimed to provide a combination for extremely long life and satisfactory performance in hard service. Short travel is an aid to easy operation. Accessibility is such that complete inspection, replacements of parts and re-assembly can be made in a few minutes and without disturbing the hydraulic piping. Connections are provided so that piping may be permanently connected above or below housing. The only internal moving parts, the stainless steel valve bodies or plungers, in several years of hard, continuous service have shown imperceptible wear due to valving action, in millions of operations.

A complete new catalog, "Quick-As-Wink" Air and Hydraulic Control Valves, is now on the press and will soon be available.

Protective Clothing for Welders

A new line of protective clothing for welders, complete for both acetylene and arc work, has been added to the comprehensive line of safety equipment of the Davis Emergency Equipment Co., Inc., 55 Van Dam St., New York. The Davis line of protective clothing for acetylene welding comprises: Goggles, sleeves, aprons, leggings, spats, and gloves. For arc welding, it includes: Helmets, hand shields, sleeves, aprons, coats, pants, leggings, spats, and gloves.

The goggles, helmets, and hand shields are equipped with glasses of various shades, each suitable for a special type of work. There are 5 different shades of goggles, ranging in use from light brazing to heavy welding, and three different shades of glasses for helmets and hand shields—for light and heavy metallic electrode work and for carbon arc work respectively. Davis protective clothing is supplied in three different materials: Fire-proof duck, asbestos, and chrome leather. Chrome leather is, however, considered superior to the other two materials because it remains soft under heat and is much more durable.

All of Davis garments are designed to give the worker maximum ease while working. Garments for use in arc welding protect the body from the effects of ultra-violet light as well as from heat and sparks.

Triple Speed with FIRTHITE
ANOTHER FIRTHITE INSTALLATION

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Firthite Sintered Carbide Tools
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Circle Ⓒ Super High Speed Steel
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C. Y. W. Choice Hot-Work Steel
Special A. S. V. Steel
J-S Chisel and Punch Steel
Firth Winged Ingot Steels
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Tool and Die Steels for Every Purpose

TURNING AND GROOVING SHEAVES FOR MULTIPLE V-BELT DRIVES

Four FIRTHITE tipped turning and grooving tools are roughing and finishing a 14-inch diameter semi-steel sheave at a cutting speed of *150 feet* per minute. The maximum cutting speed with high speed steel tools previously used was *50 feet* per minute.

From every angle and on almost any machining application FIRTHITE tools make real savings, because of this ability to cut materials at higher speeds without deformation, or loss of hardness.

The smoother more accurate finish, longer tool life and reduction in machining time result in savings that deserve the attention of production executives.

Write for new FIRTHITE price list.

FIRTH-STERLING
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Works: McKEESPORT, PA
NEW YORK CHICAGO
HARTFORD PHILADELPHIA
LOS ANGELES DETROIT
CLEVELAND DAYTON
GLOBE WIRE DIVISION
McKEESPORT, PA

Magnetic Separator

The Stearns Magnetic Mfg. Co., Milwaukee, Wis., manufacturers of an extensive line of magnetic separation equipment and friction devices, has made some radical changes in the design of its popular Type "Q" magnetic separator.

This unit has been perfected primarily for the separation of free iron from finely ground material by an inductively magnetized vibrating screen. It provides an efficient separation of unusually large capacity for material where there is very small percentage of free iron and a large amount of non-magnetic material without an appreciable loss of the non-magnetic material. The new unit is entirely enclosed and self-contained. The feeder has been lowered for greater convenience where hand labor is used.

Roller bearings of rugged construction are now used throughout. Adjustment of the vibrating screen belt has been arranged to allow alignment by a single operation and insures absolute alignment of the belt on the pulleys at all times. The vibrator mechanism has been redesigned to provide for changing the degree of intensity in vibration.

This new Type "Q" is furnished for either pulley, or motor drive and designed for DC current. Where necessary generator sets can be provided.

Shop Envelope with Lacquered Metal Back, Transparent Front

The new holder is closed on two sides and the bottom, is open at the top to form a pocket into which a print can be slid. The transparent face of non-inflammable acetate permits reading the print without removing it from the holder. The lacquered-metal back forms a firm support, keeps the print smooth. The back extends a short distance above the face, is perforated at top center so holder can be hung on a wall.

Three available sizes are 6 by 9 in., 9 by 12 in., 12 by 18 in. The holder serves to present instructions, notices, shop orders, blueprints, or any other papers, protects them against rough use, oil, dirt, moisture. Special sizes with extra metal or transparent pockets on back, made to order.

A New "Protex"

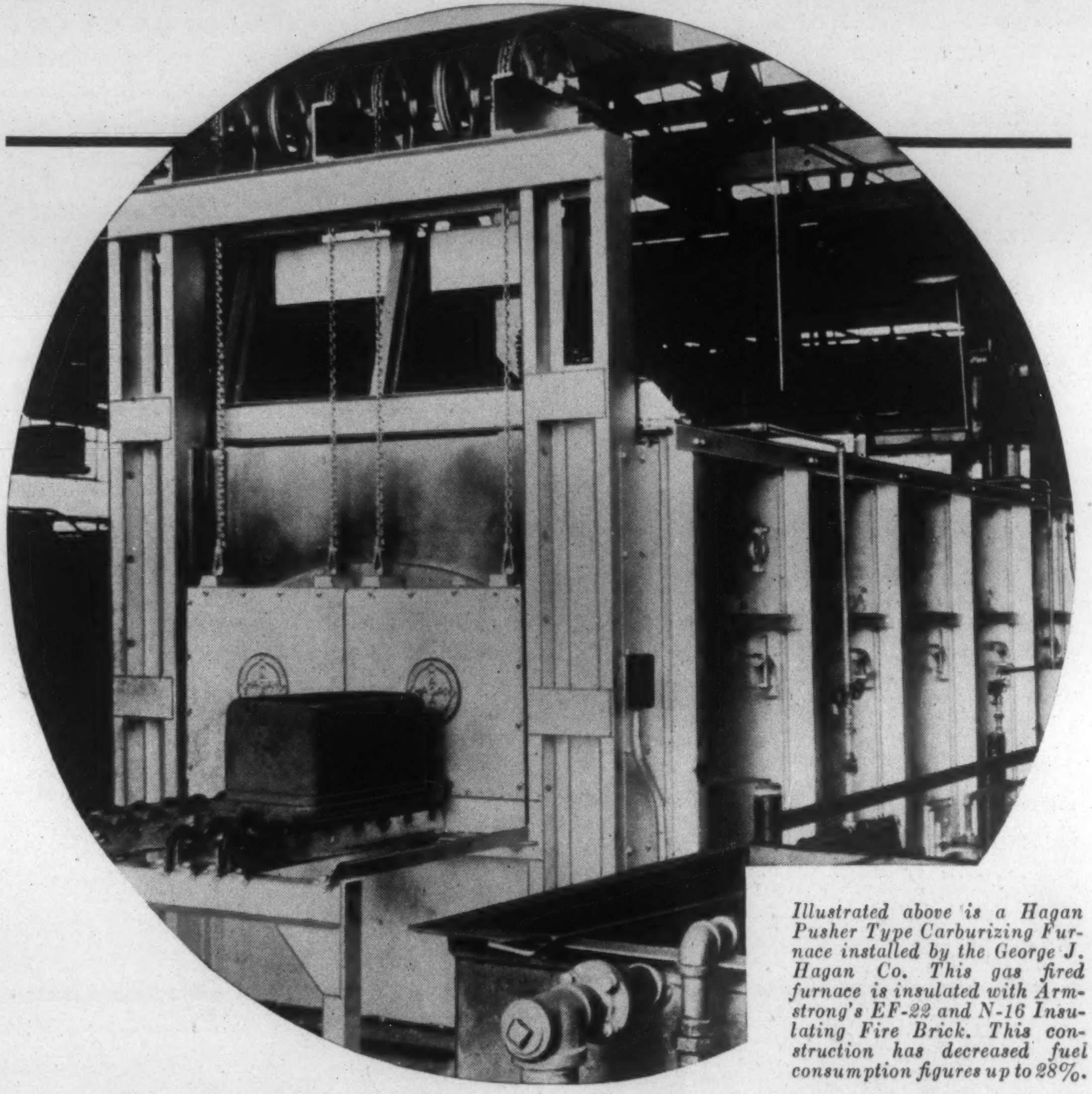
To make it easier to use "Apollo Pre-Finished" metals, sheets plated with nickel and chromium and polished to high luster, the Apollo Metal Works of Clearing, Ill., announces a new "Protex," said to be even better than the Protex first brought to market by this company a few years ago. It "sticks" well to highly polished surfaces during forming and bending operations and then may be easily peeled off or removed without leaving trace of the adhesive.

Metal workers say Protex speeds productions, reduces costs and is much more efficient when used in stamping than the old method of using ordinary paper to prevent die scratching. Samples or additional information on this metal covering can be obtained from the Apollo Metal Works for the asking.

Manufacturers are invited to send to the Editor items which are suitable for this department. Illustrations are acceptable, preferably in the form of cuts no more than 2 in. wide.

Fuel savings up to 28%

ARE OBTAINED IN HAGAN FURNACES INSULATED WITH ARMSTRONG'S BRICK



Illustrated above is a Hagan Pusher Type Carburizing Furnace installed by the George J. Hagan Co. This gas fired furnace is insulated with Armstrong's EF-22 and N-16 Insulating Fire Brick. This construction has decreased fuel consumption figures up to 28%.

Furnaces operating at 1700° F. for nearly two years have required no repairs or replacements of Armstrong's Insulating Fire Brick

In addition to maximum heat saving, Armstrong's Insulating Fire Brick provide many other advantages. They make possible the construction of thinner furnace walls and consequent larger hearth area. They assure a high heat seal on the inside of the furnace providing uniform heat distribution. These efficient brick help provide easier and more flexible temperature control with quicker heating and cooling. And because of their light weight, furnaces in which these insulating fire brick are used can be constructed of lighter steel.

The high crushing strength of Armstrong's Insulating Fire Brick makes them suitable for any type of design without sacrificing thermal efficiency. They are available in five types for a wide range of temperatures and uses behind the refractory and for direct exposure. Special shapes are made to match each of the five types of Armstrong's Brick and are of two distinct classes—machined to size and molded to size. Write today, for complete information, samples, and prices. Armstrong Cork Products Company, Building Materials Division, 982 Concord St., Lancaster, Penna.

Armstrong's

HIGH TEMPERATURE INSULATION

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